

# AAI

## AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING  
ENGINEERING • PRODUCTION • MANAGEMENT

MAY 15, 1956

### *In This Issue*

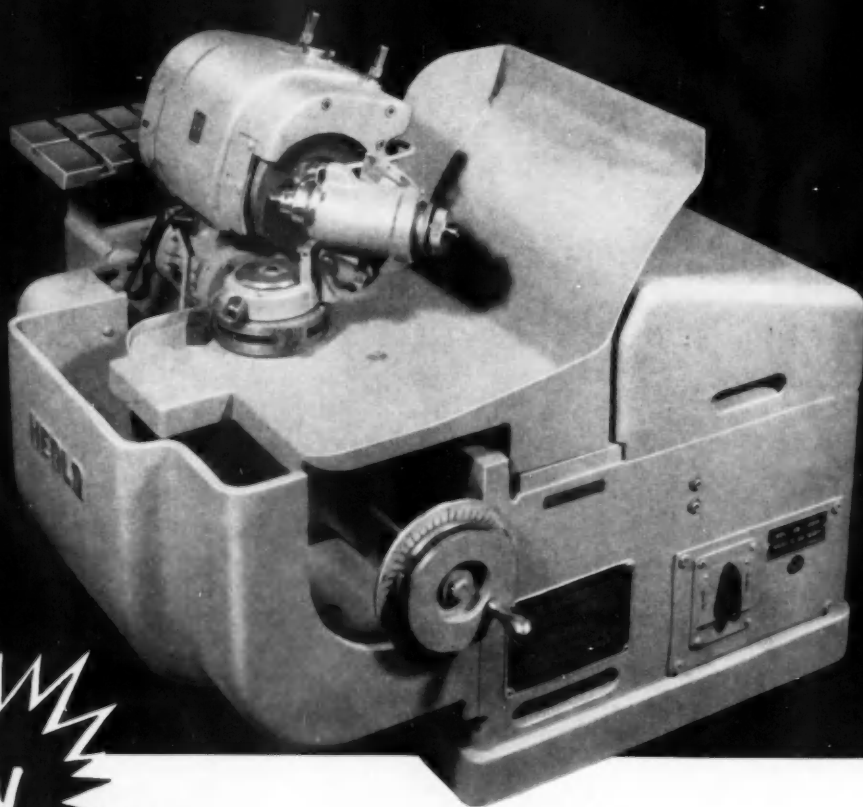
New Cars and Engines for the Indianapolis 500  
International Automobile Show and Turin Motor Show  
Special Equipment at American Motors' Engine Plant  
Features of General Motors' New Technical Center  
Unusual Techniques for Metal Adhesive Bonding  
General Electric 1050 Horsepower Turbojet Engine

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A C H I L T O N P U B L I C A T I O N

sharpen your tools

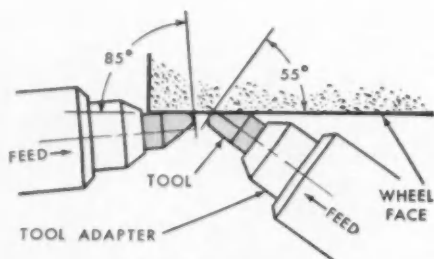
with **MACHINE PRECISION**



**new**

## **HEALD MODEL 3 TOOL SHARPENER**

saves time, gives longer tool life,  
permits faster, more efficient borizing



The oscillating tool holder swings through an arc of up to 150°, to grind a maximum side angle of 85° on one side of the tool and 55° on the other side. Front clearance angles are adjustable from -10° to +30° and tool radius can be set anywhere from 0 to 13/4". Precision calibrated scales eliminate guesswork and the mechanical machine cycle avoids any possibility of human errors or inaccuracies in the grinding operation.

LET'S face it. Off-hand grinding just isn't precise enough for modern, high-speed borizing tools. To obtain maximum borizing efficiency, tools must be of the *precisely correct shape*—in complete conformity with design specifications.

With the new Model 3 Tool Sharpener, this requirement is met—and easily. Just dial the desired tool shape on the calibrated scales, clamp the tool in the holder and press the start button. Tool holder oscillation and wheel reciprocation are mechanically controlled, grinding up to five different angles and the radius with only an occasional hand adjustment for feeding the tool against the wheel. Precision is far greater than obtainable by off-hand grinding. What's more, any desired tool shape can be *exactly duplicated* again and again.

The mechanical precision built into this improved Model 3 machine assures a sharp, flawless cutting edge that will produce more and better work per sharpening. For complete details, send for Bulletin 2-4-2. IT PAYS TO COME TO HEALD!

**THE HEALD MACHINE COMPANY**

Subsidiary of The Cincinnati Milling Machine Co.

**Worcester 6, Massachusetts**

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York





Truck powered by Waukesha WAKR (Butane).



for  
**HEAVY**  
hauling

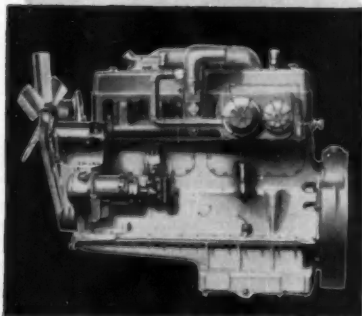
# WAUKESHA

1197 CUBIC INCH

## Extra Heavy Duty ENGINES

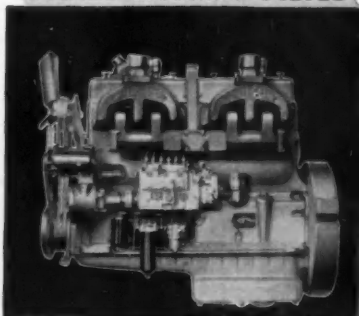
Up to 352 max. hp, all with counterbalanced crankshafts

### WAKR BUTANE



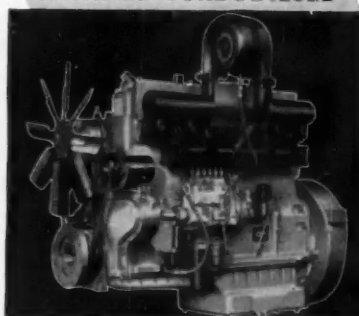
**WAKR Butane**—six cylinders, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement, 290 hp at 1800 rpm.

### WAKDB NORMAL DIESEL



**WAKDB Normal Diesel**—six cylinders, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement, 258 hp at 1800 rpm.

### WAKDBS TURBODIESEL



**WAKDBS Turbocharged Diesel**—six cylinders, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement, 352 hp at 1800 rpm.

Write for descriptive bulletins

313



WAUKESHA MOTOR COMPANY • WAUKESHA, WIS.

NEW YORK

•

TULSA

•

LOS ANGELES



Two different cast iron compressor parts are ground from the rough, holding flatness and parallelism within .001 in.

Courtesy: Whirlpool Seeger Corporation

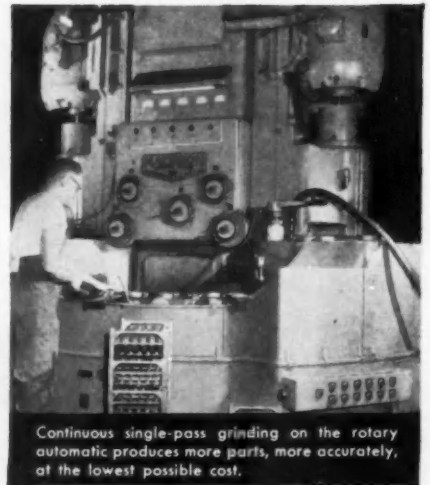
## 4800 surfaces rough and finish ground in 8 hours on Mattison 5-spindle Rotary Automatic

This Mattison No. 100 5-spindle Rotary Automatic finish grinds front and back surfaces of two different compressor parts at the rate of 2400 pieces every 8-hour shift. Parts are held in special fixtures and processed from the rough by five high-powered grinding heads, holding flatness and parallelism within .001 in.

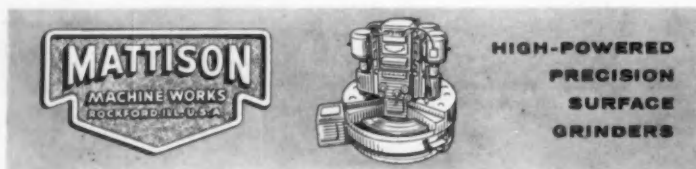
Machining of 4800 individual surfaces per 8-hour shift is a production increase of 3600 over the former rate on a single-spindle machine. One side of both parts is finished in *one pass* through the machine. The parts are

turned over, and the opposite sides are finished on the second pass. Stock removal is .077 in. per side. Wheels are set so a total of .065 in. is removed by the first three wheels. The last two remove .007 and .005 in. for finishing. Automatic sizers compensate for wheel wear, keeping parts within prescribed tolerances and eliminating frequent checking.

On long run jobs, Mattison Rotary Automatics are an advanced, high-production method for machining flat surfaces. Write for new Bulletin No. 147-2.



Continuous single-pass grinding on the rotary automatic produces more parts, more accurately, at the lowest possible cost.



# AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

MAY 15, 1956

VOL. 114, NO. 10

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MEMBER



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if the  
**SERVICE MANAGER**  
 built the  
 truck he services



**ZENITH**  
 CARBURETORS

would still be his choice

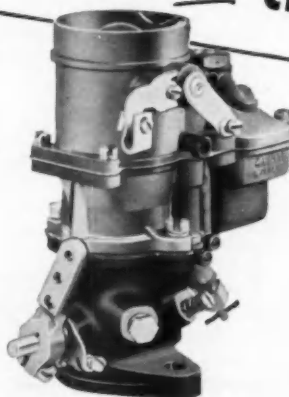
Ask any service manager why he prefers Zenith® Carburetors and you will get a ready reply.

For shrewd parts and service managers know that with the Zenith Standardized Carburetor Service Program they can actually service more makes and models with a smaller inventory investment. Yes, operating costs go down, profits up, and customers are happier with Zenith Carburetor service.

There just isn't a question about it—if parts and service managers were in the business of selecting carburetors for standard equipment Zenith would be their choice.

This sounds like a pretty good reason why—if you build, buy, sell or operate trucks, Zenith should be your choice for the best in carburetion.

\*REG. U.S. PAT. OFF.

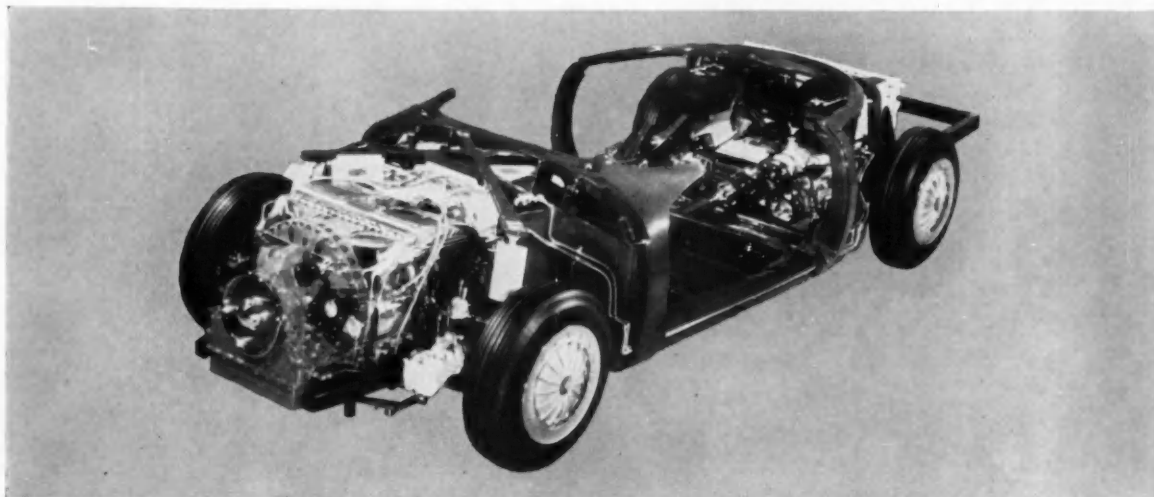
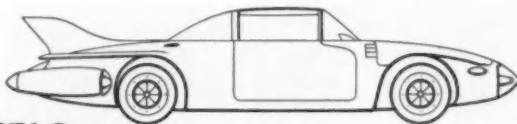


**ZENITH CARBURETOR DIVISION OF**

**Bendix**  
AVIATION CORPORATION

696 Hart Avenue • Detroit 14, Michigan • Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

**FROM 35000 RPM AT THE TURBINE  
TO 2400 RPM AT THE WHEELS . . .**

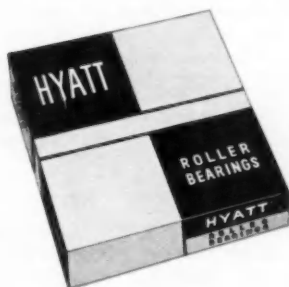


## **HYATTS SMOOTH THE FLOW OF POWER IN GM'S EXPERIMENTAL FIREBIRD II**

Taming the terrific torque of this gas turbine developed by the GM Research staff is no job for ordinary bearings. Only the *finest* straight cylindrical roller bearings can stand the gaff!

HYATTS easily handle the whirlwind speeds generated, and at the same time let the turbine shafts float horizontally when they heat up. This "free lateral" feature automatically compensates for shaft expansion *without changing the bearing centers*. In the reduction gear train, too, HYATTS pass along the power with minimum frictional losses and maximum resistance to the punishing stress and strain.

So if you've got a tough gas turbine bearing problem, come to HYATT for help. Remember . . .



*HYATT has more experience with gas turbine applications of roller bearings than anyone else in the field—why not profit by it?*

# **HYATT**

## **ROLLER BEARINGS**

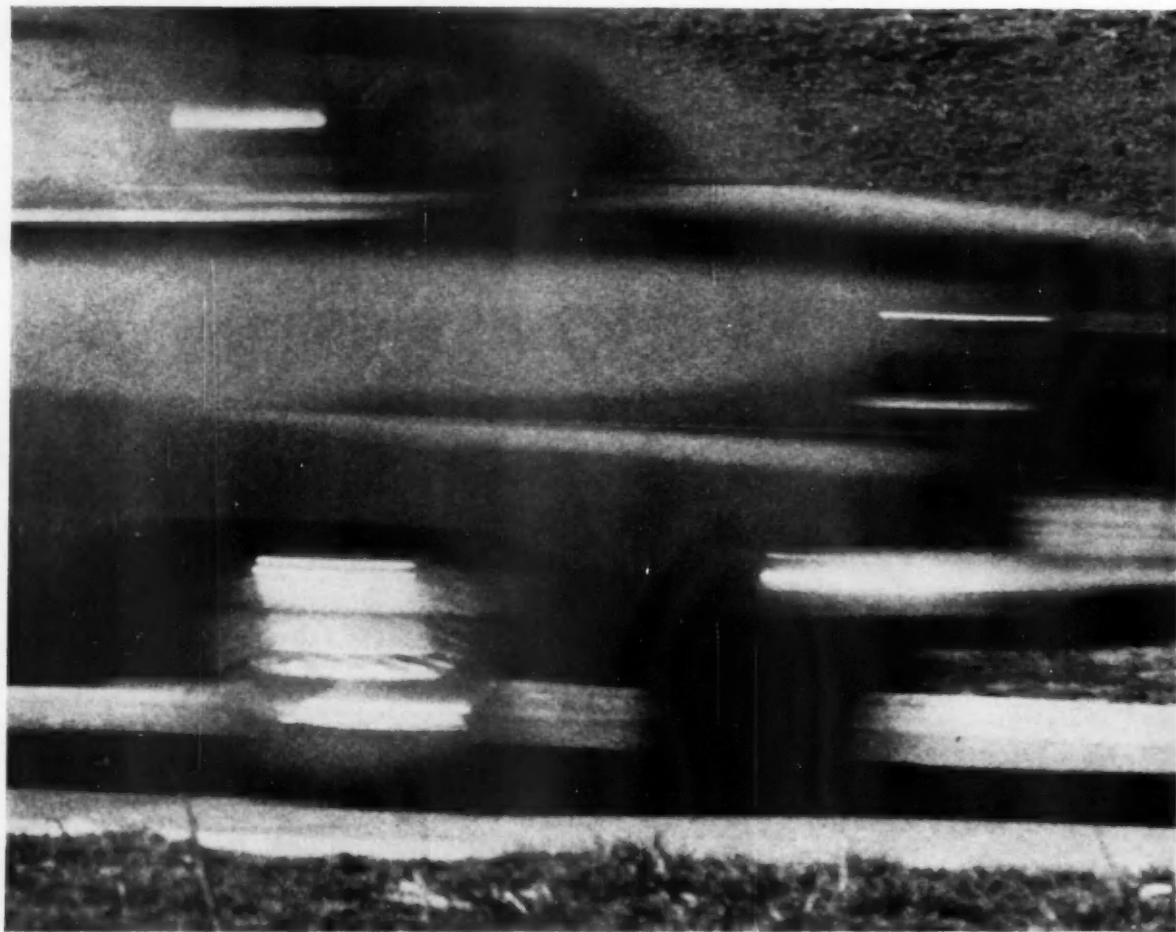
**STRAIGHT** 

**BARREL** 

**TAPER** 

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY





At today's higher sustained speeds, only nylon cord tires give maximum safety

# THERE'S EXTRA SAFETY IN NYLON CORD TIRES

*Du Pont produces the nylon fiber.  
Tire manufacturers make nylon cord tires  
—in tubeless or conventional types.*

Tires are among the components that can help make today's fine cars even safer. For our roads—whether superhighway or city street—are traveled to a point that tire failure of *any* kind is a potential danger.

- Nylon cord tires offer utmost safety, surest protection against tire trouble. Nylon tires have proved their superiority on military and commercial planes and on heavy-duty trucks. The people whose lives and livelihood depend on the ability of cars to perform at high speeds rely on nylon tires. Turnpike police, professional auto racers and high-speed test drivers are examples.
- Nylon cord tires reduce unsprung weight, and they readily absorb the added strains of power steering, braking, and higher horsepower.
- Nylon cord tires are among the components which contribute importantly to motor-car safety. They are the coming standard of the industry. As original equipment, they provide a valuable sales feature—extra safety.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



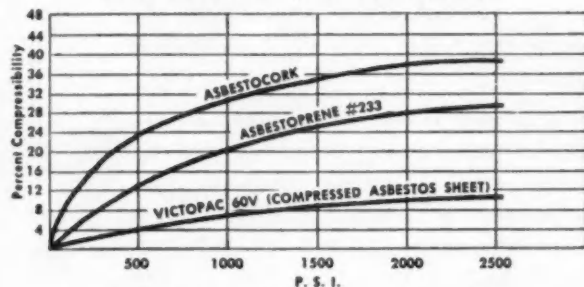
**Asbestos**  
+  
**Synthetic**  
**Rubber** =  
+  
**Cork**

# **VICTOR** **Asbestocork\***

**New "Soft" sheet  
gasket material**

**Highly compressible —  
Resilient —  
Heat resistant**

Compressibility of Asbestocork compared with  
other Victor asbestos-synthetic rubber packings



Data based on 1/16" thick Asbestocork sheet

## **VICTOR**

Sealing Products Exclusively

**GASKETS • OIL SEALS • PACKINGS**

\*Trade Mark Reg. U. S. Pat. Off.

**Asbestocork** introduces approximately 10% greater compressibility in asbestos-synthetic rubber base sheet packing. It retains fully the heat and oil resistance, and anticorrosion values of such packing. It gets its added compressibility by the addition of cork to the composition.

### **For Automotive and Industrial Sealing**

**Asbestocork** was developed especially for its wide usefulness in automotive and industrial sealing on light to medium pressures. Thorough tests on recommended applications show new levels of performance. The added advantage of economy makes it imperative that you know all about *Asbestocork*. Available in standard thicknesses, 1/32" to 1/8".

### **Sample Sheet and Technical Data on Request**

Your inquiry invited; no obligation. Please state proposed application. Prices quoted on sheet stock or finished gaskets if desired. Victor's highly developed rule die-cutting technique assures big savings on finished gaskets in any quantity.

Contact your Victor Field Engineer, or address Victor Mfg. & Gasket Co., P. O. Box 1333, Chicago 90, Ill. In Canada: Victor Mfg. & Gasket Co. of Canada Ltd., Victor Drive & Chester St., St. Thomas, Ont.

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Will your income  
and location allow  
you to live in a  
home like this...  
spend your leisure  
time like this?



*A Douglas engineer lives here*

*They can...if you start your career  
now at Douglas!*

Take that ten year ahead look. There's a fine career opportunity in the engineering field you like best waiting for you at Douglas.

And what about the Douglas Aircraft Company? It's the biggest, most successful, most stable unit in one of the fastest growing industries in the world. It has giant military contracts involving some of the most exciting projects ever conceived... yet its commercial business is greater than that of any other aviation company.

The Douglas Company's size and variety mean that you'll be in the work you like best — side by side with the men who have engineered the finest aircraft and missiles on the American scene today. And you'll have every prospect that ten years from now you'll be where you want to be career-wise, money-wise and location-wise.

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C. C. LaVene, 3000 Ocean Park Blvd., Santa Monica, California



**DOUGLAS**



**First in Aviation**

# 50<sup>th</sup> ANNIVERSARY

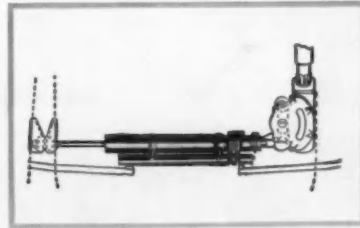
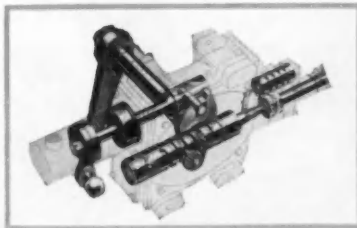
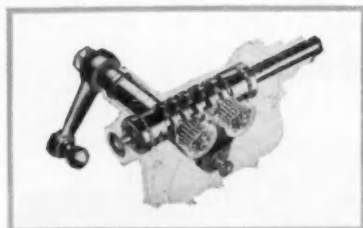
1906 • 1956

*Ross*

50 years of service  
to the industry . . .  
Easy, safe,  
economical steering!

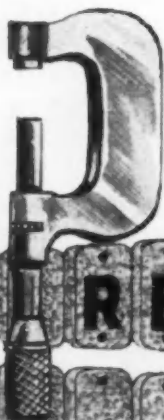
ROSS GEAR AND TOOL COMPANY, INC. • LAFAYETTE, INDIANA

## **STEERING**



**CAM & LEVER MANUAL . . . HYDRAPOWER INTEGRAL . . . HYDRAPOWER LINKAGE**

AUTOMOTIVE INDUSTRIES, May 15, 1956



# PRECISION-CUT PARTS

## *our business since 1899*

There is no phase in the production of wool felt in which Western Felt is not engaged. We start with lambs wool, and end with an endless variety of parts for the many jobs that only felt can perform.

Through it all, we're proud to say our methods have built an enviable reputation for engineering precision. Hard or soft, large or small, Western Felts can be relied upon to meet your specifications.

Tell us your basic problem—and we'll put 55 years experience to work in recommending a solution for you. Our engineers find new uses for felt every day. Your inquiry will receive prompt attention.

**WESTERN**

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Chicago 23, Illinois

Branch Offices in Principal Cities

*Felt*



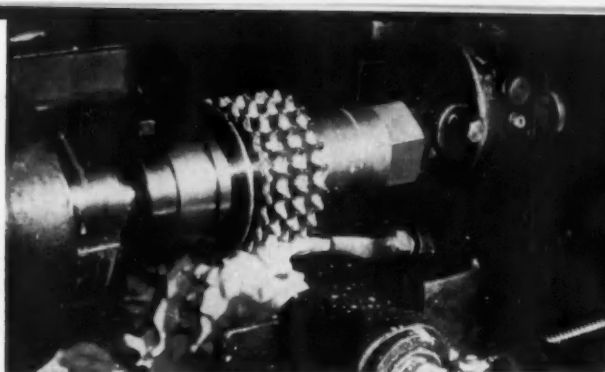
**WORKS**

MANUFACTURERS AND CUTTERS OF WOOL FELTS

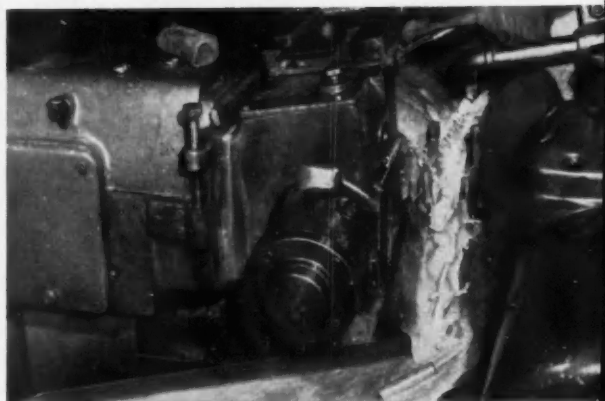




**TURNING AND DRILLING.** During the machining of a 9-in. piece using carbide-tipped tools, S.E.C.O. removes heat fast...assures long runs, top speeds.

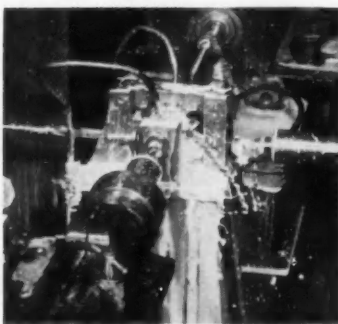


**HOBGING.** Flooding the cutting edges of a high-speed-steel hob working 1117 steel, S.E.C.O. provides lubricity and cooling power needed for long tool life.



**CENTERLESS GRINDING.** In grinding 4320 H steel pins, S.E.C.O. keeps wheels clean. Grinding dirt drops out quickly...is not recirculated. Parts are rust-protected.

## SUNOCO EMULSIFYING CUTTING OIL HANDLES 4 TOUGH JOBS...EASILY



**DRILLING AND REAMING.** On steel forgings with a 350/400 Brinell, S.E.C.O. keeps drills cool...gives clean cutting.

Whether you are shaping, hobbing, grinding, reaming, boring or milling, it will pay you to look into the advantages of SUNOCO EMULSIFYING CUTTING OIL.

Moderately priced, S.E.C.O. has been industry's most widely used soluble cutting oil for years. Higher-than-ever machining efficiency, increased detergency, easier mixing, and other added advantages are helping keep S.E.C.O. the leading emulsifying cutting oil in the country today.

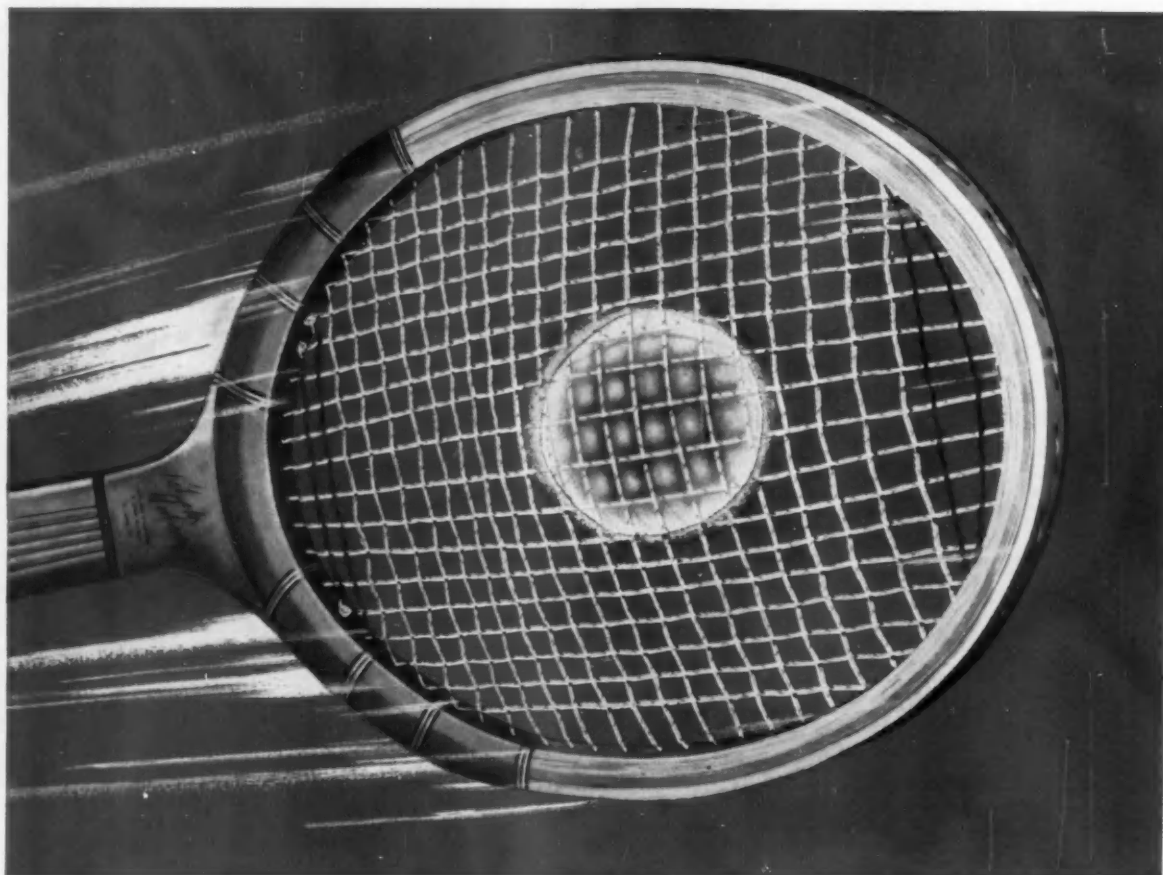
For complete information about S.E.C.O. see your Sun representative. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-5.

INDUSTRIAL PRODUCTS DEPARTMENT  
**SUN OIL COMPANY**

Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY, LIMITED, TORONTO AND MONTREAL





**"Finish first in your league"**

**...with J&L COLD FINISHED JALCASE STEELS**

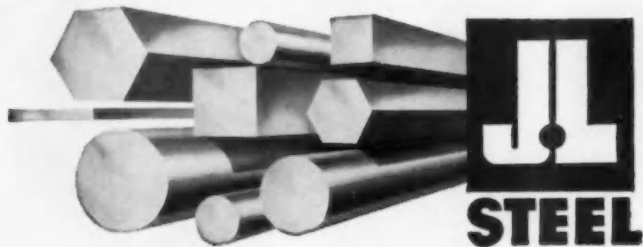
Cold Finished Jalcase—now available in 10 SAE and AISI grades—is the original free-cutting open hearth steel having the mechanical properties required for special service machined parts. And it's especially suitable for heat treating. This grade is one of a complete line of premium quality, free-machining bar steels developed over the years by J&L specialists. Thus, we can recommend the right type to help solve your particular problems.

Fundamental advantages of Jalcase are:

- Easy, consistent machinability
- Minimum distortion
- Fast, uniform response to heat treatment
- High wear resistance
- Improved cold-drawn mechanical properties

Adequate stocks are available in important industrial centers. Phone the nearest J&L District Office or your Distributor today for prompt and efficient service.

*Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line*



**Jones & Laughlin**

STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT  
PITTSBURGH, PA., AND HAMMOND, IND.

# MICROHONING\*

*Generates...*

**ACCURATE, ROUND, STRAIGHT SURFACES**

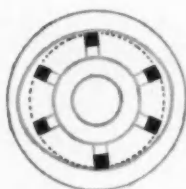
**T**ruly round, straight surfaces are generated by the application of fundamental principles on which the Microhoning process and equipment design are based:

The combined reciprocating and rotating motion of the tool act on the full length of the bore on every stroke.

The self-dressing abrasive assures sharp grits and cutting at all times.

The tool and bore automatically align themselves.

The feed-out of the tool is positive with equal pressure in all directions from the center line.



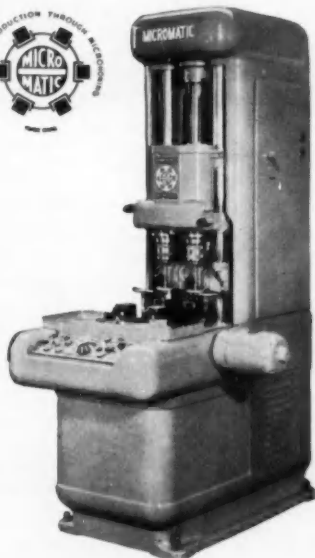
All out-of-roundness is removed by the expanding abrasive "cylinder" formed by the rotating tool. Only the tight areas are abraded until all areas have the same radius from the axis.



Wavy or snaky surfaces are made straight by the long abrasive sticks shearing off the crests of the waves.



In tapered bores the abrasives cut only in the tight area until the cylinder has the same diameter throughout its full length.



## ACTUATING LEVER

Steel Forging • 58 to 60 Rockwell "C"

Bore out-of-round and tapered .0015 to .0025 inch.

Microhoning reduces error to less than .00015 inch

Removing approx. .005 inch stock

Production—130 pieces per hour

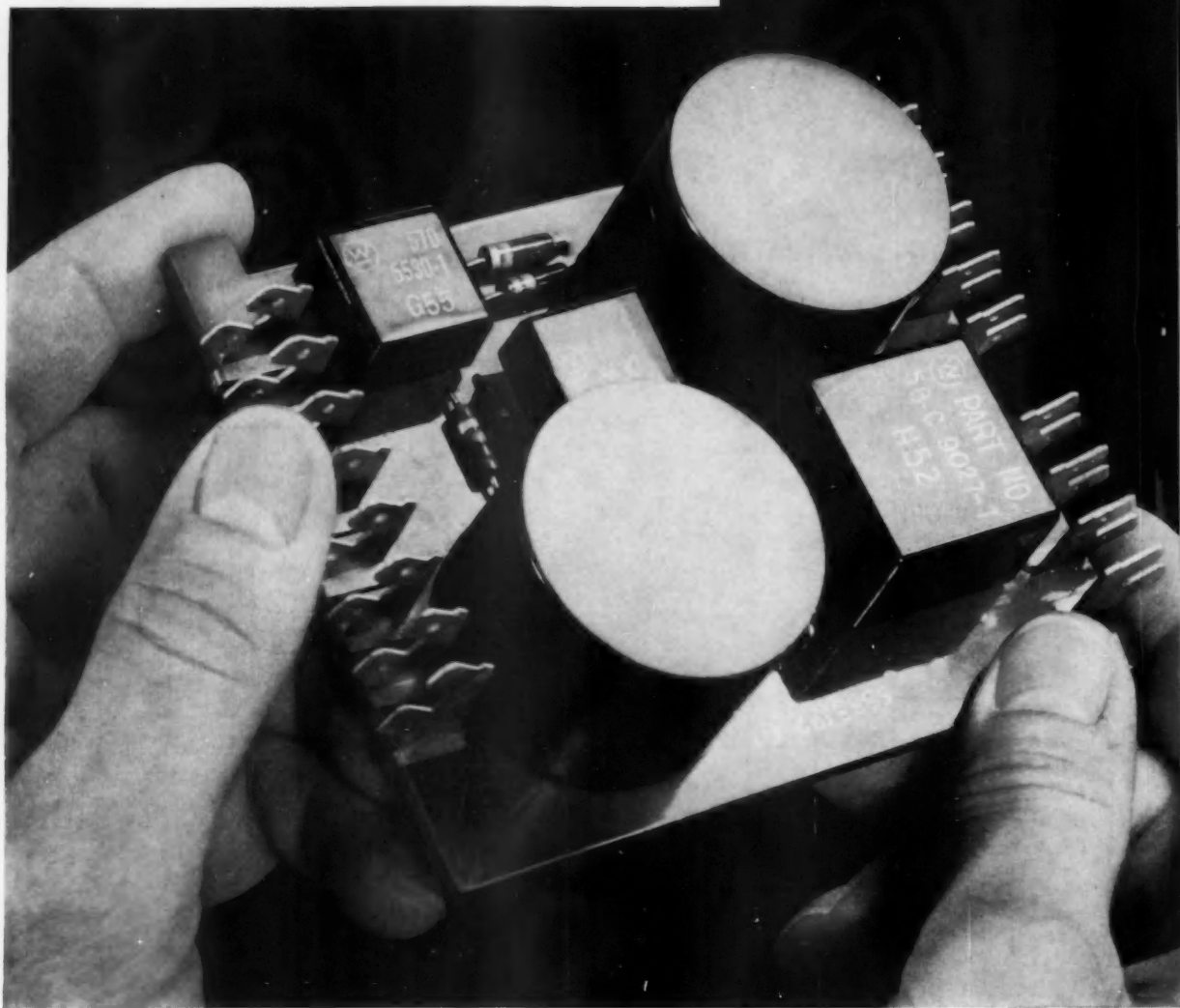
Machine—Model 705-2 Hydrohoner

\*MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish

# MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

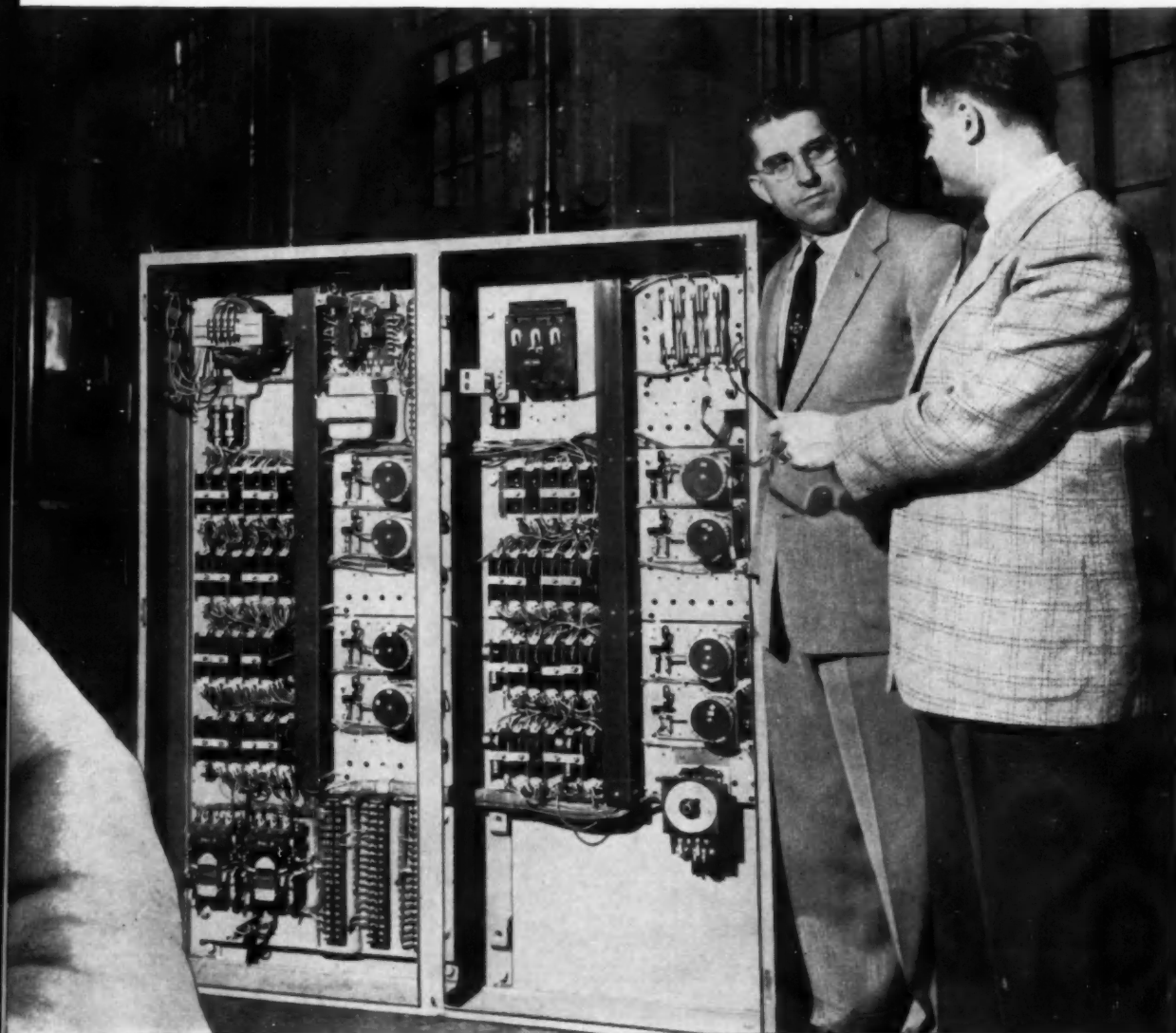
GOOD NEWS FROM WESTINGHOUSE...



**THIS IS**

**CYPAK\***

*the most revolutionary industrial control  
advance in 25 years*



Just two years ago, production and control engineers alike dreamed of the possibilities of a relay with no moving parts. A reality today, Westinghouse CYPAK introduces static control from units that fit the palm of your hand. CYPAK control has no moving parts to wear, corrode, jam or otherwise cause failure. In addition, CYPAK refines the relay art through making use of basic logic functions.

The result—static control with life at least 15 times that of conventional relays. While twenty million open-close cycles is usually the maximum life of a mechanical relay, CYPAK systems can handle that many cycles in days without a trace of fatigue.

Besides eliminating maintenance and down time, CYPAK opens new opportunities for broader, more complex control. Look into these advantages of CYPAK by calling your Westinghouse sales engineer.

\* Trade-Mark

Write today for your free copy of *The Whys and Wherefores of CYPAK*, Booklet B-6584.

Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.



**YOU CAN BE SURE...IF IT'S Westinghouse**





don't lose a day...

**THE *HOTTEST* O.B.I.**



# without the spectacular facts

TOTALLY ENCLOSED . . .  
BRAND NEW FROM THE GROUND UP.

- Rugged, front-to-back crankshaft with huge crankpin
- Fully concealed, yet accessible, driving mechanism
- Enclosed, rigidly supported gearing operates in sealed oil bath
- Electro-pneumatic friction clutch on crankshaft
- Wider spaced, longer, narrower gibs
- Wider, box type slide all within gibbing
- Precision, hardened, longer-wearing gears
- Compact, straight-line, space-saving, all-steel frame

This is it! The most talked about press in the world! The press that captured the hearts of the entire industry at the Machine Tool Show! The press that was born to do more than any O.B.I. ever built!

Get the spectacular facts and figures on this metalworking marvel . . . the all-new Niagara Series E, Front-to-Back Crankshaft Inclined. It outmodes everything within its range (75 to 200-ton capacities, 4 1/2 to 7 1/2 inch shaft diameters, standard and automated models).

## PRESS IN HISTORY!

STUDDED WITH SCORES OF  
TECHNICAL IMPROVEMENTS

- No overhanging gears, flywheel and other mechanisms
- No damaging crankshaft deflection
- Full support to wide dies — no overhang on slide
- Greater resistance to off-center loading
- Accurate alignment of slide, with minimized tendency to cock
- Substantially increased die life
- Smoother, safer press performance — simpler, thriftier servicing
- Less floorspace required

### just send this...

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N.Y.

Please rush new Bulletin 56 with all the facts on your brand new Series E Inclined.

Name \_\_\_\_\_ Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_  
At \_\_\_\_\_

### to get this...

26 FACT-FILLED PAGES



# NIAGARA

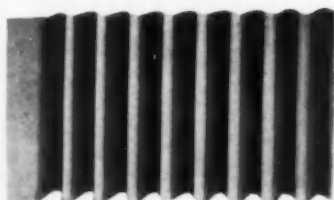
## front-to-back crankshaft INCLINABLE PRESSES

America's Most Complete Line of Presses, Shears, Press Brakes, Other Machines and Tools for Plate and Sheet Metal Work.

*now...*

**LINDBERG-  
FISHER  
Electric  
RESISTANCE**

**FURNACE WITH...**



CORRATHERM elements are large sheets of nickel chromium. They are easy to install, just hang in furnace, and operate at extremely low voltages, completely eliminating shock or short hazards.

See the Lindberg-Fisher Electric Resistance Furnace in operation at the Casting Congress and Exhibit in Atlantic City. We'll also be showing the new Lindberg-Fisher Electric Reverberatory Holding Furnace and Automatic Ladling Unit.

## **CORRATHERM HEATING ELEMENT**

For permanent mold, sand casting, and die casting of aluminum, magnesium, zinc and lead, Lindberg-Fisher now offers its improved Electric Resistance Furnace with the revolutionary new CORRATHERM Heating Element.

Lindberg-Fisher ER Furnaces have, time and again, meant lower cost per lb. of finished casting. And with practically indestructible CORRATHERM elements, lower furnace maintenance costs and longer crucible or pot service assure you of even greater savings.

These furnaces eliminate localized heating of metal, and gas absorption, because no products of combustion are present. No exhaust fumes or smoke means less operator fatigue and higher production. Investigate the advantages of this furnace. Write for Bulletin No. 321.

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FISHER**

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FURNACES**

*A Division of Lindberg Engineering Company*

**2491 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS**

Why limit yourself to "STOCK" sizes?

# Hannifin can ship the cylinder you need within 48 hours!

(NEW AND EXPANDED PRODUCTION FACILITIES MAKE THIS POSSIBLE)

## Any mounting style in:

Series "A" Square Head Air Cylinders—1½" to 14" bore

Series "H" Square Head Hydraulic Cylinders—1½" to 8" bore

Series "LW" Cast Head Air Cylinders—1" to 12" bore

### Strokes

As specified to 60"

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Catalog standards, including standard alternates.  
Most special rod ends require only 24 hours longer.

### Cushions

Either or both ends if required

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Normally any quantity you need for rush jobs.  
For large quantities specify your requirements.



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When the need is urgent  
call long distance.  
Experienced sales engineers  
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From Chicago Phones Only—ROdney 3-4000

Do you have these two  
newest Hannifin catalogs?

BULLETIN 113—  
Series "H"  
Hydraulic Cylinders

BULLETIN 213—  
Series "A"  
Air Power Cylinders

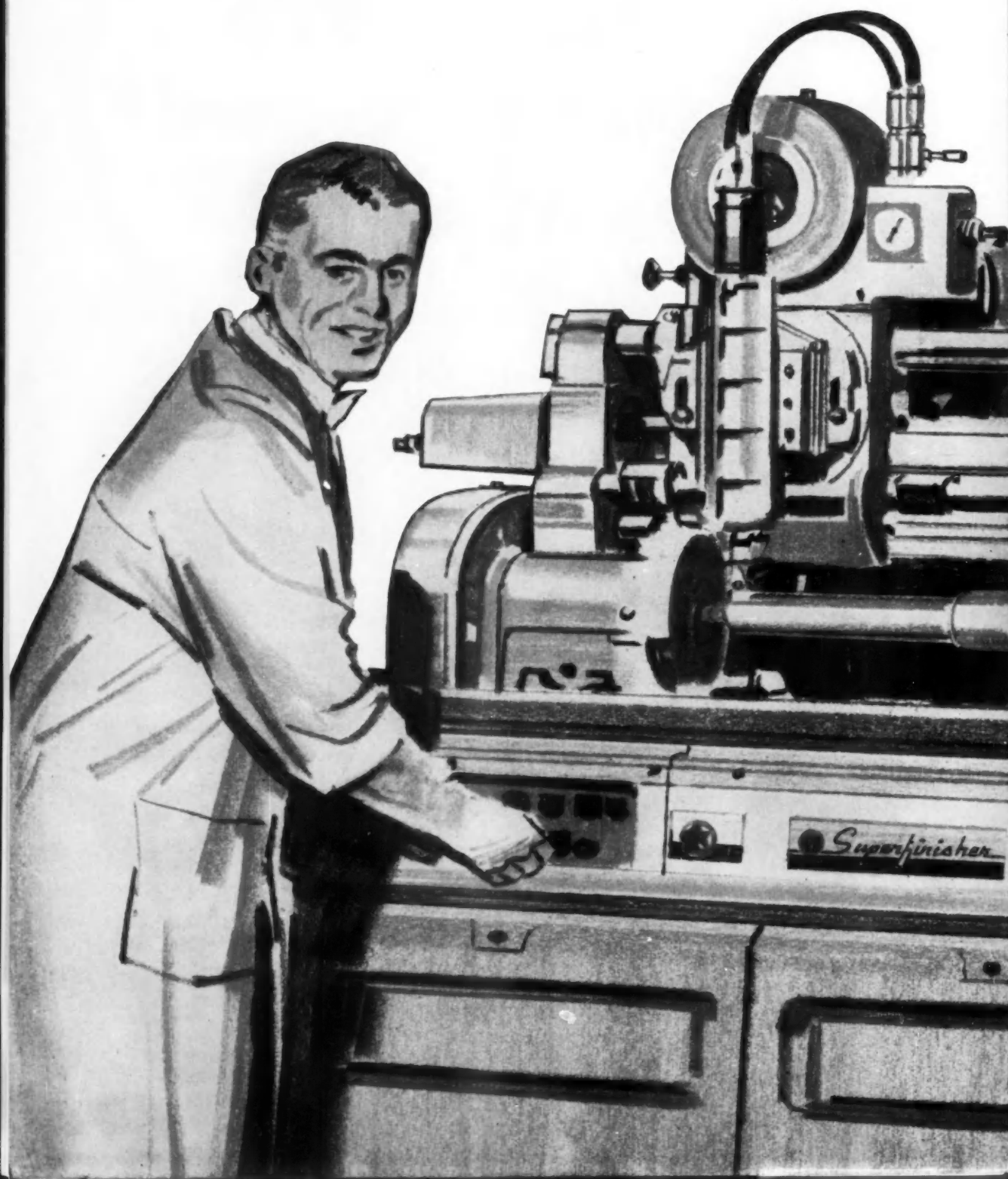
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# HANNIFIN

Hannifin Corporation, 543 S. Wolf Road, Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves



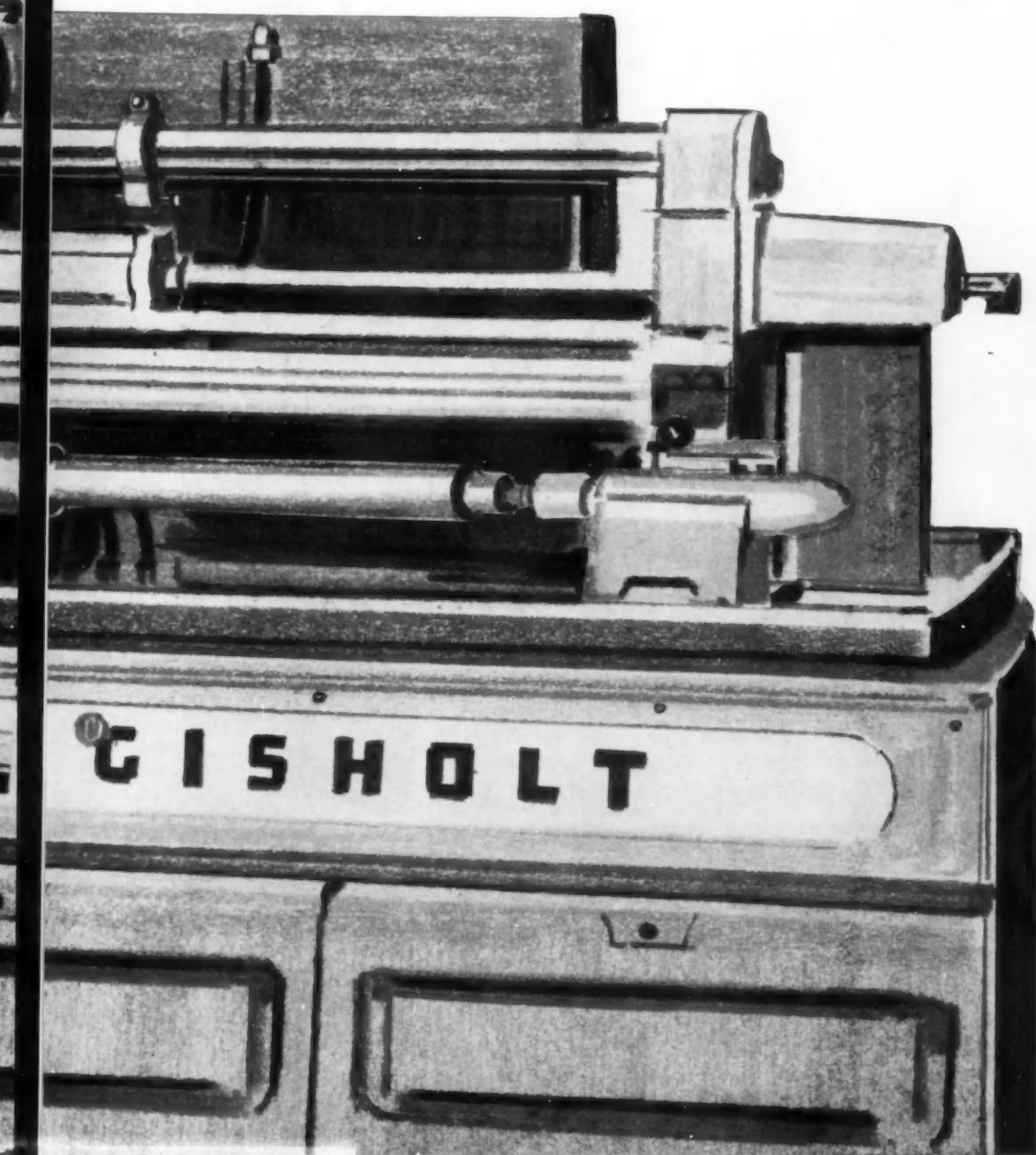


## GISHOLT MASTERLINE 52A SUPERFINISHER



The Superfinishing process is recognized as one of the most important contributions to modern metalworking. Now—in this new 52A MASTERLINE Superfinisher—Gisholt offers an outstanding machine for either small job-lot work or high production runs. Other general purpose and high production models complete the line. Let us give you the complete facts on how Superfinishing may be profitably applied to your manufacturing processes—plus full details on the complete line of Gisholt Superfinishing Machines.

Gisholt Machine Company, Madison 10, Wisconsin  
*Look ahead—keep ahead—with Gisholt*



# NEW!

Revolutionary AIRengineering Development by Ingersoll-Rand

**TORSION BAR**

## *Torque control* **IMPACTTOOLS**

**MULTIPLE TORQUE SETTINGS**  
**2 TORSION BARS AVAILABLE:**

- No. L735. Max. torque 60 ft. lbs.
- No. H735. Max. torque 90 ft. lbs.



Now you can have  
precision torque  
control with all the  
nut running power  
and speed of the  
world famous I-R  
IMPACTOOL!



Size 5040T\*

\*For torques up to 550 ft. lbs., a Size  
5340T Torque Control Impacttool is available

*... how can YOU use these*  
**ADVANTAGES ON NUT RUNNING JOBS**  
*where prescribed torques must be met?*

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impacttool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impacttools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.



Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.

Ask your Ingersoll-Rand AIRengineer for a demonstration now . . . or write direct for more information on this amazing development.

# Ingersoll-Rand

Impacttool Division  
11 Broadway, New York 4, N.Y.



# FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



## Technical-ities

By John S. Davey

### What's the right torque for bolts?

This is one of the toughest questions we're asked. Too many variable conditions. But the following may help.

The bolt takes two stresses during wrenching: (1) Torsion, (2) Tension. Tension is what you want. Torsion is the necessary evil due to friction. Probably 90% of applied torque goes to overcome friction.

With the friction factor changed by lubrication, plating, etc., the torque needed to produce a given tension is hard to predict. However, a useful empirical formula exists for normal friction conditions.

#### Inch-lbs. Torque =

**0.2 x bolt diameter x bolt tension**

Many tests show that the 0.2 torque coefficient is approximately constant for the usual friction conditions, for all diameters, and for both coarse and fine thread. Average deviation is about 7%. But when are conditions "normal"? The only sure way to check torque is to set up a pilot assembly and try it out.

In pilot testing for rigid joints, tighten a few bolts with torque wrench to failure, and then set torque at 75% of that load; or even at yield strength, since torsion component vanishes leaving bolt under tension only, which is well below ultimate strength.

We've worked up curves giving suggested torques for various size bolts. Send for a copy.

## How to make a stronger joint

From research on structural steel joined with high strength bolts come facts applicable to products:

These bolts can be torqued to high tension for a large clamping force on joined members. Resultant friction overcomes shearing forces and prevents slippage. The higher compressive forces also protect bolt holes from fatigue cracks. Moreover, the tighter the bolt, the less chance for loosening, and the less risk of bolt fatigue due to dynamic loading.

High strength bolts are stronger in shear, too. In recent tests, rivets and "soft" bolts broke under extreme shear load; but high strength bolts didn't—the joined steel failed first.

### APPLYING THE ADVANTAGES

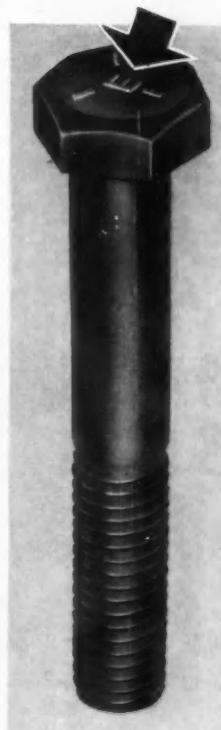
Since high strength bolts have 2 to 3 times more tightening strength than common bolts, smaller diameter bolts can be used. As discussed above, these make a stronger joint; also weigh and cost less.

Along with good joint design, it's important that fasteners used can meet requirements. For example: A manufacturer designed vibrating machinery for high tensile bolts, but it was assembled with low carbon bolts. Joints failed. RB&W high carbon bolts with hardened washers solved the problem.

**Moral:** Specify even your standard fasteners.

RB&W selects the proper grade of steel to give "Empire" high strength fasteners the precise balance between tensile strength and ductility.

Feel free to call on RB&W for help in selection and use of standard, low cost fasteners.



Three radial dashes on bolt head denote a high strength bolt. The "E" identifies Empire bolts, an RB&W trademark. These markings assure highest quality standard fasteners with full strength, and uniformity of size and physicals.

●  
Russell, Burdsall & Ward Bolt and Nut Company . . . plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

## Silicon bronze fasteners combine desirable features



Silicon bronze offers the highest conductivity of fasteners able to withstand high stresses. It resists corrosion, stays free from season cracking, too. It makes ideal fasteners for electrical use where tensile strength is important; or for corrosive environments.

One of the first to develop such fasteners, RB&W cold works them for tensile strength and for clean, well formed threads that don't seize. Oval bolts, hex bolts and nuts and U bolts available. Specials can be developed.



Counterboring a hole in a steel workpiece. Notice the chip uniformity. Here is evidence of the free-cutting action you get with Continental Counterbores. Double driving lugs on the cutters engage double abutments in the holders to give a balanced, positive drive. Notice, too, the wide cutter flutes aiding in chip disposal.

CTW

## How to get smooth cutting and ruggedness with large diameter COUNTERBORES

And even after the toughest cuts the Continental Cutter disengages from the holder with a quick twist of the wrist. Because of the shape of the driving members, wedging or jamming cannot occur to delay the interchanging of cutters.



Continental Counterbore Sets are available in your choice of sizes. Each is fully described in Bulletin 60446. Write for your copy today.

and quick, twist-of-the-wrist disengagement, too



Machine operators know that the real test of a counterbore drive is how it stands up under the stresses imposed during large diameter cutting operations. And operations like these have been the proving ground for Continental Counterbores. In customers' plants Continental Drives and Cutters, regardless of size have demonstrated their extreme ruggedness. An added feature to save minutes: Each Continental Counterbore Holder accommodates a wide range of cutter sizes.

# Continental

**TOOL WORKS**  
Division of Ex-Cell-O Corporation  
Detroit 32, Michigan



# BENDIX-WESTINGHOUSE AIR BRAKES—

## Best buy for your trucks

## because they're preferred by America's

## Leading Fleet Operators!



**"We've bought 1,333 trucks**

AND WHEN IT COMES TO AIR BRAKES, WE PREFER

***Bendix-Westinghouse!***

THE WORLD'S MOST TRIED AND TRUSTED AIR BRAKES

MR. R. A. GOODLING  
President, Dixie Highway Express, Inc.

From his company's general headquarters in Meridian, Mississippi, Mr. Goodling, newly elected national chairman of the Common Carrier Conference, American Trucking Association, directs one of the nation's most safety-conscious fleet operations. Serving points in Mississippi, Georgia, Alabama and Louisiana, this company in 1953-54 won the National Safety Award in the ten to twenty million mile group of the general commodity class. Dixie Highway Express, Inc., employs over 700 people, maintains 13 terminals and operates on certified routes totaling nearly 1,500 miles.



**"We've bought 2,600 trucks**

AND WHEN IT COMES TO AIR BRAKES, WE PREFER

***Bendix-Westinghouse!***

THE WORLD'S MOST TRIED AND TRUSTED AIR BRAKES

MR. C. BERTRAM BOFFENBERGER  
President, Baltimore Transfer Company  
and Motor Freight Express, Inc.

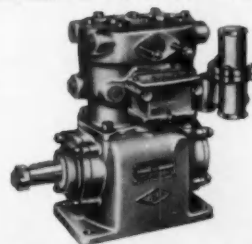
The Baltimore Transfer Company and Motor Freight Express, Inc., with general offices at Baltimore, Maryland and York, Pennsylvania, integrate operations so as to form a motor carrier system serving the major portion of the Middle Atlantic States. These companies employ over 1,600 people and have a combined fleet of better than 1,000 vehicles. The system has fourteen terminals in Pennsylvania, New Jersey, Maryland, Washington and Virginia and handles over a million individual shipments a year.



For twenty-five years Bendix-Westinghouse Air Brakes have been the first choice of truck manufacturers and truck operators everywhere, consistently out-selling all other makes of air brakes combined. In fact, recognition of the greater safety, economy and dependability of Bendix-Westinghouse Air Brakes by truck buyers has resulted in their factory installation on an ever increasing

number of truck models of all sizes.

Chances are good that your trucks, too, offer the many advantages of these powerful brakes. If not, we suggest that you take advantage of the proven preference and superiority of Bendix-Westinghouse Air Brakes by offering them as factory-installed equipment. It's one sure and easy way to add more sales appeal to your vehicles!



Over 1,500,000 compressors, produced over a twenty-five-year span, stand behind the TU-FLO 400. Many advanced features guarantee performance no other compressor can equal.

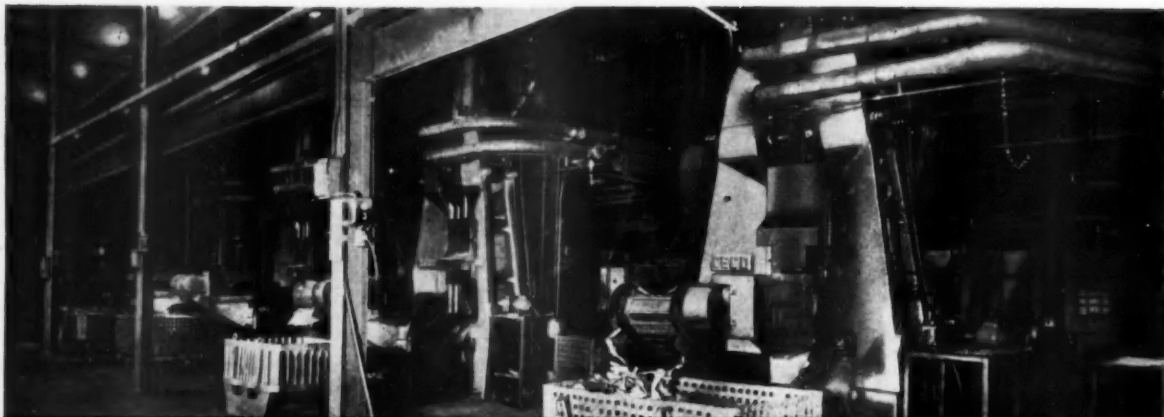
***Bendix-Westinghouse***



**AIR BRAKES**

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY • General Offices and Factory—Elyria, Ohio. Branches—Berkeley, Calif. and Oklahoma City, Okla.





Four of six Ceco-Drops which replaced Board Hammers in a large automobile forge shop

• **CECO-DROP.**

The Ceco-Drop was selected because of better maintenance record and ease of operation



High production is maintained—there are no boards to change—fewer adjustments to make

• **CECO-DROP.**

The Ceco-Drop is safer and easier to operate. "Leg fatigue" is eliminated. There are no overhead hazards



Parts shown here are typical Ceco-Drop forgings

• **CECO-DROP.**

They are automobile shock absorber parts—pitman, anchor and arms

Have you the latest CECO-DROP bulletin? Write CHAMBERSBURG ENGINEERING COMPANY, Chambersburg, Pa.

# Rugged seal for a Rambler



## LOCKS E. P. LUBE IN FOR A FAST PINION

In the dashing, new Rambler, the rear pinion may turn up to 3800 rpm—and, on a hot day, lube temperature may run 250° or more . . . and it is vital that the E.P. lubricant protecting this pinion be retained under all operating conditions. American Motors posed this key problem to Chicago Rawhide: provide a pinion seal that would more than withstand the temperature involved, and equally important, resist the deteriorating effects of a high sulphur content in E.P. lubricants. C/R engineers recommended the new C/R Type W Oil Seal. Result: this unique seal is delivering positive, dependable sealing performance under the most rugged road conditions.

Do you have a difficult sealing problem? C/R engineers

will welcome the opportunity to work with you in the selection of the correct seal style and material for your application. Write for detailed information.

*More automobiles, farm and industrial machines rely on C/R Oil Seals than on any similar sealing device.*

**CHICAGO RAWHIDE MANUFACTURING COMPANY**  
1205 Elston Avenue • Chicago 22, Illinois

Offices in 55 principal cities. See your telephone book.

**In Canada:** Manufactured and Distributed by Super Oil Seal Mfg. Co., Ltd., Hamilton, Ontario

Export Sales: Geon International Corp., Great Neck, New York



### Other C/R Products

Sirvene (synthetic rubber) molded pliable parts • Sirvis-Conpor mechanical leather cups, packings, boots • C/R Non-metallic Gears



**Balls  
of Steel  
Brass, Bronze  
Monel Metal  
and  
Stainless  
Steel**

*for  
Over a  
Quarter  
Century*

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*Largest Independent and Exclusive Metal Ball Manufacturer*

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## CALENDAR

OF COMING SHOWS AND MEETINGS

- National Industrial Advertisers Association, convention, Palmer House, Chicago, Ill. .... May 20-23
- Automotive Advertisers Council, spring meeting, Homestead, Hot Springs, Va. .... May 22-25
- American Management Association, general management conference, Hotel Roosevelt, New York, N. Y. .... May 23-25
- Aviation Writers Association, annual convention, San Francisco, Calif. .... May 27-June 2
- National Fluid Power Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va. .... May 28-30
- Indianapolis 500-Mile Race .... May 30
- AGMA Annual Meeting, Homestead, Hot Springs, Va. .... June 3-6
- SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .... June 3-8
- Sixth International Mechanical Engineering Conference, Paris, France .... June 4-9
- Material Handling Institute 1956 Exposition, Public Auditorium, Cleveland, O. .... June 5-8
- American Society for Quality Control, annual convention, Montreal, Canada .... June 6-8
- Seventh National Plastics Exposition, Coliseum, New York, N. Y. .... June 11-15
- Society of the Plastics Industry, conference and annual meeting, Commodore Hotel, New York, N. Y. .... June 11-15
- National Truck, Trailer and Equipment Show, Los Angeles, Calif. .... June 14-17
- ASME Semi-Annual Meeting, Hotel Statler, Cleveland, O. .... June 17-21
- ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .... June 17-22
- International Machine Tool Exhibition, London, England, June 22-July 6
- Drop Forging Association, annual meeting, The Homestead, Hot Springs, Va. .... June 24-27
- Machine Tool Builders' Sales Conference, Purdue Univ., Lafayette, Ind. .... July 30-Aug. 3
- Air Force Association, national convention and airpower panorama, New Orleans, La. .... Aug. 1-5
- SAE National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif. .... Aug. 6-8
- American Association of Motor Vehicle Administrators, annual conference, Royal Alexandra Hotel, Winnipeg, Manitoba, Canada .... Aug. 21-24
- Western Electronic Show and Convention, Los Angeles, Calif. .... Aug. 21-24
- International Ignition Conference, sponsored by Scintilla Div. of Bendix Aviation Corp., Sidney, N. Y. .... Aug. 22-24
- SAE National Tractor Meeting and Production, Forum, Hotel Schroeder, Milwaukee, Wis. .... Sept. 10-13
- National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .... Sept. 12-14
- Instrument - Automation Conference and Exhibit, Coliseum, New York, N. Y. .... Sept. 17-21

AUTOMOTIVE INDUSTRIES, May 15, 1956

# WITH VERS-O-TOOL HEADS

you get PRODUCTION advantages on any job requiring end-forming, turning, thread cutting

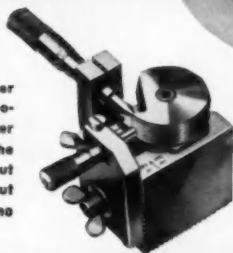
## QUICK, SIMPLE CHANGE-OVER

Vers-o-tools provide for quick removal of threading chasers (or milling cutters) on their holding blocks—without disturbing head adjustment or set-up.



## NO "CUT-AND-TRY" REQUIRED

Take the guess-work out of chaser grinding with the "Namco Vers-o-tool System": sharpen each chaser on its holding block, then check the grind on Namco micrometer gage; put the set back in the head without need for further adjustment—no "cut-and-try" required.



## MANY REGRINDS PER SET

You can grind and regrind 270 usable degrees of Namco chaser circumference—one set cuts more threads than 10 sets of conventional chasers.



use the same Vers-O-Tool Head . . . change only cutters and blocks



THREADING



END-FORMING



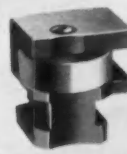
END-TURNING



TURNING-THREADING



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FOR COMPLETE DETAILS SEND FOR BULLETIN DT-52

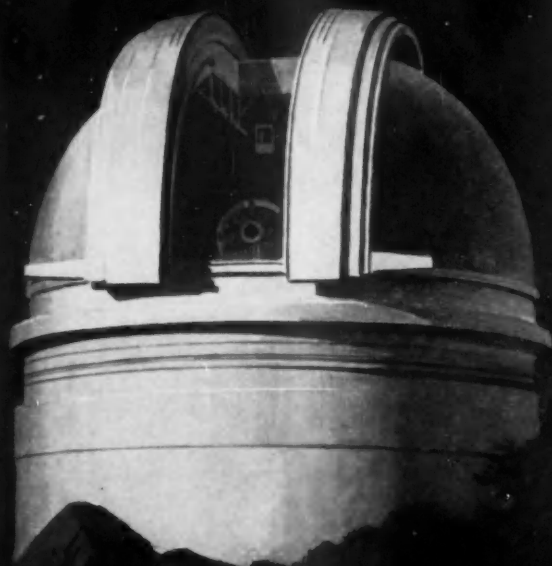
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# FORESIGHT



## Planning for tomorrow • Producing for today!

Since the earliest days of the industry, Bendix foresight in product design and development has contributed materially to automotive progress.

For example, Bendix\* power braking and power steering, two of the industry's most popular new car features, are the results of years of research and engineering by Bendix specialists in these important fields.

Today Bendix engineers are likewise busy planning

and developing new and better products to meet the needs of the years ahead.

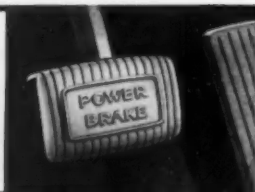
It is because of this foresight the automotive industry looks to Bendix for components that continue to lead in public acceptance and dependable performance.

\*REG. U.S. PAT. OFF.

**BENDIX PRODUCTS DIVISION SOUTH BEND INDIANA**

Export Sales: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

### TYPICAL EXAMPLES



Bendix Power Brakes



Bendix Power Steering

*Bendix*  
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## High Spots of This Issue

### ★ Making Crankshafts, Pistons, and Rods at AMC

Continuing a survey of production operations performed on the new AMC V-8 engine, the author covers in this article work on a number of smaller components. Crankshafts, connecting rods, and pistons are subjects of study. Page 48.

### ★ New Engines and Cars for the Indianapolis 500

Automotive enthusiasts are awaiting with impatience this month the 40th annual running of the Indianapolis 500 on May 30. To give them an insight into what they may expect to see, AI presents this special race preview. Page 54.

### ★ Latest Creations at International Automobile Show

Inaugural major event in Manhattan's brand new exhibition Hall—the Coliseum—was the International Automobile Show. Described and illustrated here are selected examples of the some 150 domestic and foreign cars shown. See Page 59.

### ★ The 38th Turin Motor Show

Colorful showcase for the latest developments in Italian automotive styling and mechanics is the annual Turin Motor Show. This on-the-spot report pinpoints the highlights of the new styling concepts and chassis features. Page 66.

### ★ Power Steering Pump Design

Demand on the part of the car-buying public for such conveniences as power steering has exerted pressure on automobile manufacturers to keep perfecting designs. Reviewed here are the alterations and improvements in hydraulic parts. Page 70.

### ★ 38 New Product Items And Other High Spots, Such As:

New GE turbojet; arc welds shielded with CO<sub>2</sub>; Westinghouse machine tool forum; Texas B-O-P plant; molybdenum punch coating; GM Technical Center; metal adhesive bonding; piston pin quality; bonding automatic transmission bands; Czechoslovak aircraft; plastic car parts; and electric heat.

**Complete Table of Contents, Page 3**  
**Automotive and Aviation News, Page 33**

AUTOMOTIVE INDUSTRIES COVERS—  
 PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES  
 • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •  
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**or solid**

**a steel tube or bar  
for every purpose**



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Whatever your tubing requirement—whatever kind and quantity you need—you can get quick delivery of a quality product with a single call to Ryerson.

That's because Ryerson stocks are the nation's largest, including more types and sizes, more tonnage, than any other source. And Ryerson service facilities are unequalled, too.

Hack saws, band saws and equipment for production lathe cutting and chamfering assure quick service on your orders. In addition, a staff of tubing specialists puts years of experience to work on your problems of tubing selection and fabrication. So call Ryerson for everything in tubing and tubing service.

In stock: Cold drawn and hot rolled seamless mechanical tubing, hot and cold rolled welded tubing, hydraulic and cylinder tubing, structural tubing, etc.

**COLD FINISHED BARS**

Careful handling, accurate cutting, vigilant inspection—these are just three of many ways in which Ryerson assures you of the highest quality in cold finished bars.

Stored in temperature-controlled rooms, spark-tested to guard against mixed steels, Ryerson cold finished bar stocks include rounds, squares, hex's, flats—screw steel, accuracy stock, turned, ground and polished shafting, Ledloy for fastest machining—everything you need. And even the hard-to-get intermediate sizes are on hand.

To help you select the best cold finished bar for each application, we have just published a simplified guide showing the comparative strength, cost, machinability, workability, etc. of all commonly used types. Write for your copy and call Ryerson when you need high quality cold finished bars.

## **RYERSON STEEL**

In stock: Bars, structurals, plates, sheets, tubing, alloy and stainless steel, reinforcing bars, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND  
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 114, No. 10

May 15, 1956

## Chrysler First Quarter Sales, Profits Off From 1955 Period

Sales and earnings of Chrysler Corp. for the first three months of this year showed a marked drop from those in the first quarter of 1955. The former fell off 23 per cent to \$742,349,267 from \$958,128,384 a year ago, while profits declined to \$10,905,772 from \$34,504,730 for the first three months of 1955.

In spite of the sales decline, Chrysler said the first quarter volume was the third highest of any first quarter in its history. The record first quarter was in 1955, while the second highest first period was in 1953, when sales totaled \$924,257,000.

The corporation's car and truck shipments in the first quarter were 305,661 units. This figure was 33 per cent less than the 454,948 units shipped in the first quarter in 1955.

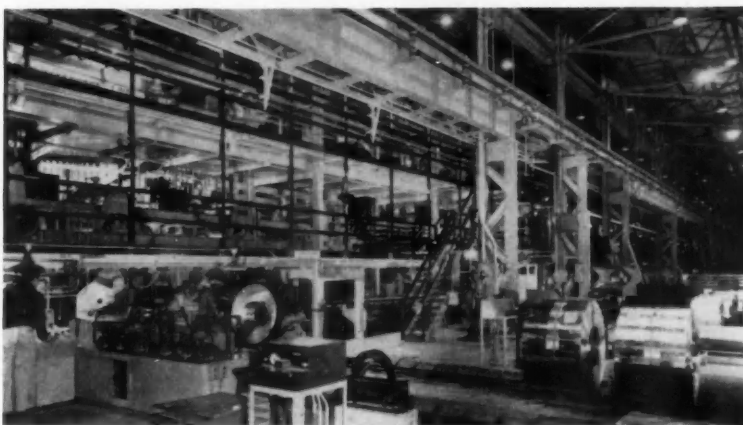
Defense work during the first three months of this year amounted to \$60 million, or about eight per cent of total sales. This compared to \$35 million, or about four per cent of total sales a year earlier.

The company spent \$17,872,798 in the first quarter for improvements and additions to land, buildings, machinery, and equipment. The figure was up 19 per cent from the \$15,028,041 in the first three months of 1955.

## Harvester To Move Indianapolis Engine Operations to Louisville

International Harvester Co. will transfer its entire manufacturing operations for Black Diamond truck engines from its Indianapolis Works to its farm tractor plant in Louisville, Ky. Moving of equipment is scheduled to start this fall.

Engine production is expected to get underway at the Louisville unit in April, 1957. The Indianapolis plant will be used for the production of the company's new V-8 truck engine.



## GALVANIZED SHEET FLOWS FROM J & L HOT-DIP LINE

Jones & Laughlin Steel Corp. has launched production on its new \$6.25 million continuous hot-dip galvanized line. Utilizing the Armco-Senzimir process, it has a rated capacity of 7000 to 8000 tons a month and is 610 ft long overall. Electric Furnace Co. designed and installed the furnaces, while General Electric Co. furnished all drive and control equipment. Aetna-Standard Engineering Co. was prime contractor on project.

## Caterpillar To Build New Plant In Illinois

A 2.25 million sq ft factory for production of small crawler tractors and tractor shovels will be constructed by Caterpillar Tractor Co. in Aurora, Ill., under the company's \$190 million expansion program. Construction on the plant will get under way in June. In addition to the new Aurora facility, Caterpillar also plans to expand its Joliet and Decatur plants. Demand for Caterpillar equipment has increased to a large degree.

## GMAC Retail Volume Soared By \$96 Million In Quarter

A report from General Motors Acceptance Corp. reflects the upward trend in credit buying since the beginning of the year. Total volume obtained by the finance corporation in the first three months, including retail and wholesale, amounted to \$2.48 bil-

lion compared with \$2.26 billion last year.

Retail receivables alone were up \$96 million in the quarter. Net income totaled \$11.35 million, compared with \$8.12 million a year earlier.

## Ten Dodge COE Trucks Have New V-8 Engines

Dodge is introducing a new line of cab-over-engine trucks ranging from 17,000 to 21,000 lb (max.) GVW and from 30,000 to 45,000 lb (max.) GCW. Two new V-8 engines of 172 and 201 gross horsepower power the new line of 10 COE models.

The 10 models have a front bumper to rear of cab dimension of only 81 in., and are offered in wheelbases ranging from 108 to 162 in. and in cab-to-axle dimensions ranging from 60 to 114 in. Front axle capacities run from 4700 to 6000 lb and rear axle capacities from 13,000 to 17,500 lb.

# News of the AUTOMOTIVE



## FREIGHT TRAIN TIPTOES OVER SNOWY TERRAIN

*This Diesel-electric-powered vehicle for wheeled transport in Arctic areas travels on 16 gigantic tires that measure four ft wide by 10 ft tall. Every wheel on the Sno-Train has its own motor and gear reduction driving from inside the rim. The long carrier was built for the Army Transportation Corps by R. G. LeTourneau, Inc.*

## Ford Employees Contribute Record Amount to Charity

Ford employees and the Ford Motor Co. Fund last year donated nearly \$3 million to various charities and health

and community services. Of the total, Ford employees themselves gave a record \$1.9 million.



## CAREFUL TESTING AT GE INDUCTION MOTOR PLANT

*Shown above is just one example of the modern facilities found in the new electric motor plant of General Electric Co. at Schenectady, N. Y. (see AI, May 1, p. 35). All motors, as shown here, receive running, sound, and electrical characteristics tests on rotating tables at the end of each standard production line.*

## American Motors Net Loss For Quarter \$3.34 Million

American Motors Corp. continues to operate in the red. For the quarter ended March 31, the company had a net loss of \$3.34 million, compared with a \$654,390 loss in the comparable quarter a year earlier.

Actual operating loss for the six months ended in March totaled nearly \$8 million. However, a non-recurring profit of \$7 million from the sale of stock in Ranco, Inc. in the latter part of last year reduced the net loss to \$827,555 for the October-March period.

In the quarter ended in December, AMC had an operating loss of \$4.6 million, but by applying the \$7.1 million non-recurring profit to that quarter it came out with a net profit of \$2.5 million. AMC's six-month actual operating loss of nearly \$8 million compares with a loss of \$6.1 million in the first six months of the previous fiscal year.

The Rambler line of automobiles continues to play a leading role in the company's efforts to hold its share of the automobile market. While sales of the larger Nash and Hudson models have fallen off, the Rambler is holding its own in the current market.

Production of Ramblers in the first quarter was estimated at more than 29,000 units, against slightly under 23,000 in the 1955 quarter. Rambler sales are exceptionally good in running more than 15 per cent ahead of last year and accounting for about 70 per cent of AMC's total car volume.

## Allis-Chalmers Sales Hit Peak In Quarter

Despite a general decline in farm equipment buying, Allis-Chalmers sales for the first three months rose to a record \$140 million. The company cleared \$5.58 million or slightly more than the \$5.57 million in the 1955 quarter.

To offset the lower sales of farm equipment anticipated in the coming months, Allis-Chalmers continues to diversify its other activities, such as power equipment, construction machinery and industrial equipment. The company had a backlog of orders totaling \$174 million on March 31.



# AND AVIATION INDUSTRIES

## Thompson Predicts 1956 Sales Will Equal Last Year's Total

Unlike many parts suppliers, Thompson Products, Inc. is not too disturbed over the current low level of sales. Although first quarter sales dropped by \$4 million from the like 1955 period, the company is highly confident that business for 1956 will match last year's \$286 million and possibly set a record in 1957. The company bases its optimism for 1957 on the assumption that automobile production will head upward again to record heights.

## GM Seen Dropping Plans For Its 1957 Motorama

General Motors' multi-million-dollar Motorama road shows reportedly have been abandoned, at least for next year, because of the forthcoming National Automobile Show in New York next December. Whether or not GM will take up the Motoramas again in subsequent years has not been determined.

## New Contract Concessions Granted to Ford Dealers

Ford Motor Co. last month announced a number of new concessions for its 9000 dealers to mark another move by the automobile industry to improve relationships with dealers. While the new Ford concessions are not as broad as those made earlier by General Motors, the company is studying other programs, and additional changes are expected to come shortly.

Chrysler has not yet made wide changes in dealer franchises comparable to those granted by GM and Ford, but it is studying various proposals. It has, however, granted 100 per cent warranty cost reimbursement.

Among the more significant changes made by Ford are the establishment of a three-man dealer policy board, a change in billing methods, and an option of a five-year contract, which can be terminated by the factory only for cause. Other programs now under study include a number of group benefits and financial aid provisions similar to those granted recently by GM.

Other changes made by Ford in-

## PHONOGRAPH BASE PLATE

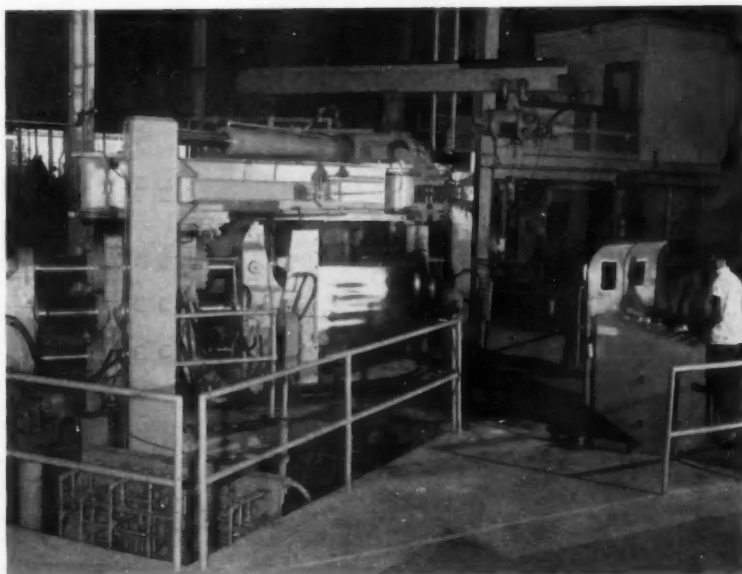
Cast - in projections, cored recesses, openings, and other attachment points are clearly seen in underside view of die-cast base plate for the phonograph unit offered in Chrysler cars. CBS-Columbia selected this design because the required rigidity and compactness are afforded.



clude the establishment of a National Institute of Marketing. It is designed to upgrade the automobile retail business through training programs on ethics, management, and selling techniques, plus a clear-cut statement of company policy on bootlegging, price-packing, and false registrations.

The dealer policy board, designed to give dealers a direct line of com-

munication to top management, will require the attention of three Ford executives, who will resign from their present positions. It will be headed by Benson Ford, group director of the Mercury and Special Products Divns., and include Walker A. Williams, sales and advertising vice-president, and A. S. Hatch, formerly Western regional sales manager of Ford Div.



## UNIFORM SHEET METAL PARTS FROM STRETCH PRESS

This huge Huffer stretch-wrap forming machine in operation at the San Diego, Calif., plant of Convair Div. of General Dynamics Corp. is said to double the production of sheet metal parts fabricated for aircraft. Operator at console (far right) controls the rate and strength of pressures applied on metal sheet. The console can be set to operate automatically as well as manually. The stretch equipment is hydraulically operated and has a pulling capacity of 318,000 psi, it is specified.



# News of the AUTOMOTIVE

## Kelsey-Hayes Licensed For Control Systems

Kelsey-Hayes Wheel Co. has been licensed to manufacture and sell automatic control systems and components developed by Control Specialties, Inc., of Inglewood, Calif. Control Specialties has a number of projects under development at present for aircraft, missile, and helicopter applications.

## International Adds V-8 Line To Heavy-Duty Truck Models

A new "V-Line" of heavy-duty trucks, featuring three new V-8 engines, is now in production by International Harvester Co. Complete de-

scriptive details of the new trucks and engines will appear in an early issue of AUTOMOTIVE INDUSTRIES.

Nine series of trucks in conventional and cab-over-engine, four and six-wheel design, comprise the V-Line. Models are available with GVW ratings of 24,000 lb and up, and GCW ratings of 50,000 lb and up.

Power is supplied by new International V-8 engines of 401, 461, and 549 cu in. displacement with horsepower ratings of 206, 226, and 257, respectively. The V-8 power plants are additions to the line of six-cylinder Red Diamond gasoline and LPG engines, and Diesel engines available in the International heavy-duty truck models to meet varied operating needs.

## Senate Probers Urge GM To Cut Car Prices

Congressional investigations into the affairs of General Motors Corp. continue to hold headlines. While basic arguments of the inquiries remain centered on the corporation's growth, new suggestions bob up from each new committee taking over the investigations.

Latest recommendations are presented in a Senate staff report made to the committee on anti-trust and anti-monopoly laws. Most of them, in essence, are similar to those made during investigations in the past year or so. They include the splitting of the GMAC financing subsidiary and one or more divisions away from the corporation to operate independently. Suggestions for further improvements in franchises with dealers are also made.

One of the new suggestions is that GM reduce the prices on its cars. Such action appears completely out of the picture now, in view of prospects for steel price increases.

Several automobile companies already have indicated that higher price tags are almost certain to appear on 1957 models, if the steel industry raises prices. Of course, a price reduction by GM would probably result in even greater domination of the market by the corporation.

The voluminous report presented by the Senate staff cites figures on the volume of business GM has in various fields. GM charges that, although it has testified before on various phases of its business, the Senate subcommittee staff report does not present a true picture of its operations. It protests that the conclusions are "wholly unwarranted" and that they do not fairly represent the record of the hearings.

## Buick Estate Wagon Output Double Last Year's Volume

Buick has built almost twice as many estate wagons so far this model year as it has in any full model year in its history. Production of 1956 estate wagons up to April 30 amounted to nearly 13,000 units, compared to 7195 during the entire 1955 model year.

## 1956 U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

	For Weeks Ending				Jan. 1 through May 5, 1956
	May 5	April 28	April 21	April 14	
<b>PASSENGER CAR PRODUCTION</b>					
Hudson	265	546	608	560	15,424
Nash	1,328	1,190	1,037	1,256	35,270
Total—American Motors	1,593	1,736	1,645	1,816	50,694
Chrysler and Imperial	2,740	2,248	2,232	2,664	47,907
De Soto	1,950	2,161	2,290	2,360	43,777
Dodge	4,277	4,326	4,050	4,050	75,389
Plymouth	9,388	11,916	11,785	11,216	184,440
Total—Chrysler Corp.	18,356	20,651	20,357	20,290	351,513
Continental	26	21	30	30	902
Ford	27,202	27,510	28,767	30,149	505,394
Lincoln	1,249	1,446	1,496	1,412	20,999
Mercury	6,139	7,442	7,196	7,350	98,622
Total—Ford Motor Co.	34,616	36,419	37,469	38,931	625,917
Buick	9,723	10,751	11,079	13,292	250,312
Cadillac	3,385	3,380	3,382	3,370	60,119
Chevrolet	29,494	37,482	38,920	38,376	651,047
Oldsmobile	7,674	8,112	8,245	9,869	194,189
Pontiac	9,720	6,299	6,376	7,603	148,571
Total—General Motors Corp.	55,986	66,024	68,002	72,510	1,304,238
Packard	423	712	596	746	9,786
Studebaker	1,760	1,646	1,300	1,541	39,160
Total—Studebaker-Packard Corp.	2,183	2,358	1,896	2,287	48,946
Checker Cab	105	88	105	120	940
Total—Passenger Cars	112,838	127,276	129,494	135,954	2,382,248
<b>TRUCK PRODUCTION</b>					
Available	11	11	14	13	149
Chevrolet	7,042	7,656	7,759	8,063	145,111
G. M. C.	1,982	2,034	2,003	2,039	37,570
Diamond T	95	97	100	97	1,745
Divco	80	80	80	80	1,560
Dodge and Fargo	1,960	1,880	1,712	1,805	31,430
Ford	6,062	5,351	6,038	6,496	114,232
Four Wheel Drive	52	31	42	18	756
International Harvester	2,793	2,879	2,901	3,028	53,333
Mack	305	531	374	336	6,701
Marmon-Harrington	0	0	0	9	163
Reo	74	74	77	76	1,312
Studebaker	367	339	467	474	5,704
White	385	368	362	367	6,951
Willys	1,348	46	1,419	1,296	22,159
Other Trucks	99	120	115	107	2,000
Total Trucks	22,655	22,031	23,463	24,306	430,886
Buses	61	162	97	69	1,461
Total—Motor Vehicles	135,574	149,409	153,054	135,954	2,814,615

# AND AVIATION INDUSTRIES



## SPEEDY UNDERCOATING

Plymouth has recently put into operation a new \$150,000 installation for the undercoating of cars. A four-man team goes to work here on a station wagon body on the final assembly line at Plymouth's main plant in Detroit. Sixty-two pounds of insulating material are applied to each vehicle in the process.

## Chrysler Delaware Plant Ends Production of Tanks

The last Patton 48 medium tank has rolled off the assembly line at Chrysler Corp.'s Newark, Del., plant to mark completion of a \$160 million contract awarded the company in 1954. Now that tank production has ended at the plant, Chrysler will start converting the one million sq ft facility for production of Plymouth cars.

Present plans call for expanding the plant considerably. Automobile production is scheduled to start early next year.

The plant will become Chrysler's first East Coast automobile assembly unit. It will supplement Plymouth production in Detroit, Evansville, Ind., and California.

## Increase in Parts Prices Appears to be in Offing

Automotive replacement parts prices are expected to head upward again later this year after steel prices advance. Car makers already have warned that price tags will go up following notice by the steel industry that prices may be up as much as \$10 a ton, possibly even more, after wage negotiations are completed by June 30.

# TABLOID

Square D Co. will build a new combination warehouse and assembly plant in Denver, Colo.

\* \* \*

Abrasive Metals Products Co. has acquired Sta-Warm Electric Co.

\* \* \*

Clark Equipment Co. has opened a new storage depot and assembly facility in Richmond, Calif.

\* \* \*

Fruehauf Trailer Co. has acquired Independent Metal Products Co. . . . U. S. Industries, Inc., has taken over General Farm Equipment Co. and A-1 Bit & Tool Co.

\* \* \*

Briney Manufacturing Co., specializing in the manufacture of boring heads, is name of new subsidiary formed by Goddard & Goddard Co.

\* \* \*

Chrysler Corp. of Canada will soon start shipping cars to New Zealand, Hong Kong, Jamaica, British Guiana and Singapore.

\* \* \*

Du Pont Co. has started a multi-million dollar expansion program at its Belle, W. Va., works.

\* \* \*

Trainer Corp. of America is name of new company formed in Buffalo, N. Y., to design and build aircraft procedure trainers. . . . Clemco Aero Products, Inc., is name of new concern formed in Compton, Calif., to manufacture missile and aircraft components.

\* \* \*

E. W. Bliss Co. West Coast Div. has doubled facilities at its Southern California branch at 816 N. Hollywood Way, Burbank, Calif.

\* \* \*

Rem-Cru Titanium, Inc., has opened sales offices in both New York and Chicago.

Jones & Laughlin Steel Corp. is studying the manufacture of stainless steel products.

\* \* \*

Russia is said to have produced an experimental sports car with a plastic body.

\* \* \*

A. O. Smith Corp. plans to expand its Electric Motor Div. plant at Milwaukee, Wis. . . . Automatic Electric Co. has launched a multi-million dollar expansion program.

\* \* \*

GE Medium Induction Motor Dept. has created four operating sections to improve customer service.

\* \* \*

Republic Steel Corp. has increased its stainless steel manufacturing facilities by 18 per cent.

\* \* \*

India is considering the establishment of an aircraft engine plant in the country.

\* \* \*

Webber Engineering Corp. has changed its address to P. O. Box 217, Indianapolis 6, Ind. . . . Withrow Die Casting Co. is moving into a new enlarged plant at 13164 Leadwell St., North Hollywood, Calif.

\* \* \*

Mesta Machine Co. has bought the Government's huge New Castle, Pa., foundry.

\* \* \*

Speedway Petroleum Corp. has introduced a new Soler-refined gasoline.

\* \* \*

Lear, Inc., has established operating subsidiaries in Switzerland and Germany. . . . Bristol Aeroplane Co. of Canada has formed a Mexican subsidiary called Bristol de Mexico, S. A. de C. V.

(Turn to page 106, please)

# News of the AUTOMOTIVE

## Ford Earnings in Quarter Off But Still Second Best

Lower automobile sales continue to be reflected in financial statements of automobile companies. Ford Motor Co.'s earnings for the first three months declined to \$73.7 million from the record \$102 million in the first quarter last year. The net was the second best on record, however, topped only by last year's.

Sales declined by more than 14 per cent to \$1.2 billion, compared with \$1.4 billion last year. Factory sales of cars and trucks in the first quarter totaled 523,392, about 20 per cent below the 657,714 units for the same period last year.

## New West Coast Plant Scheduled By Fruehauf

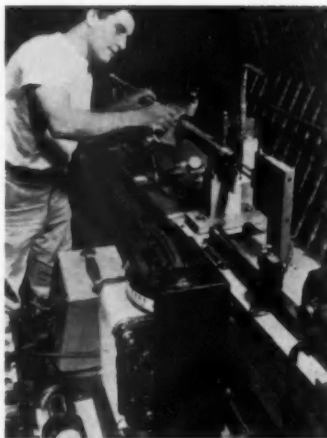
Fruehauf Trailer Co. plans to build a 250,000 sq ft truck-trailer manufacturing plant in California to serve the expanding West Coast market. The new plant is another step in the company's continuing expansion program from coast to coast, under which it has acquired a number of new facilities in the past several months.

Construction on the new plant, to be located on a 100-acre site 41 miles east of Los Angeles, is scheduled to start this October with operations to begin next February. When in full operation, it will employ upwards of 1000 persons. Fruehauf operates two other plants in the Los Angeles area.

## GE to Spend \$5 Million More On Aircraft Engine Program

Investment of an additional \$20 million for small aircraft engine research and development is planned by General Electric Co. during the next five years. The sum is earmarked for new facilities, including the latest development and test equipment.

The replacement value of facilities currently utilized by the GE Small Aircraft Engine Dept. in Lynn and Everett, Mass., and Ludlow, Vt., totals almost \$40 million. The department employs approximately 5000 persons and has more than one million sq ft of floor space.



## GUN BARRELS GAGED

Ordnance Div. of E. W. Bliss Co. has boosted production on its 20 mm machine gun barrel line through the use of a unique electronic recording gage. Built by Cleveland Instrument Co., the gage checks three separate tapers in the chamber of the barrel. In addition to 20 mm barrels, Bliss is active in production of Navy carrier catapult launching devices and other classified projects for the military services.

## June SPI Conference Program Includes Automotive Subjects

Special feature of the forthcoming Conference and Annual Meeting of the Society of the Plastics Industry, to be held from June 11 through June 15 at the Hotel Commodore in New York City, will be an automotive session on the morning of June 13. Subjects to be covered will include: pre-mixed molding; advances in body manufacturing techniques; discussion of components and trim; and trends in automotive styling.

Another particular session of interest will be on the morning of June 11 on the role of cellular plastics in transportation (subways, aircraft, automobiles, trains, ships, etc.). Other sessions on the program for the rest of the week will be devoted to such subjects as packaging, building materials, refrigeration and air conditioning, and communications.

Running concurrently with the SPI Conference and Annual Meeting is the Seventh National Plastics Exposition at the Coliseum in Manhattan. Among the exhibitors with dis-

plays of particular interest to the automotive industries will be Celanese Corp., Monsanto Chemical Co., Bakelite Co., Du Pont Co., and Glass Laboratories, Inc.

## Air Springs Set For One 1957 Car

Air suspension will be offered on at least one high-priced 1957 model car later this year. It is understood to be a modification of the type now used on buses and trailers. The car also will feature a "memory" seat, which slides back to permit easy exit and automatically returns to its forward position.

## Shell Molding and Automation Highlight AFS Show Exhibits

Shell molding and automation equipment aroused a great deal of interest among the many visitors to the 60th Castings Congress and Show in Atlantic City, N. J., early this month. Sponsored by the American Foundry Men's Society, over 250 companies displayed equipment valued at over \$5 million.

There were 10 operating exhibits which dealt with the shell molding process. One of these, operated by Link-Belt, was an automated machine with a capacity of 240 shells per hour to be used for casting outboard motor crankshafts.

In automated cleaning machines, American Wheelabrator announced its Super Tumblast. This particular type of machine has already been installed in three foundries which make automotive and aircraft parts. The new unit has a 28 cu ft capacity and has been equipped with special alloy steel blades and a special alloy steel barrel liner.

Pangborn Corp. showed its new automated Rotoblast cleaning equipment. This unit is completely automatic for both loading and unloading onto power conveyors.

One of the interesting units in the inspection field was the isotope radiography unit displayed by the Budd Co. This machine has a range in steel from ¼ in. to eight in. thick. It uses either iridium 192 or cobalt 60 as its gamma source.

Austin-Western displayed its four-

# AND AVIATION INDUSTRIES

wheel drive and steer all-hydraulic crane with a 35 ft boom. A company executive stated that foundries will purchase approximately 300 yard-cranes during 1956 and Austin-Western hopes to get its share of this market.

Monsanto Chemical Co. announced four new foundry resins for the shell molding process. The new products are all phenolic formulations—two of the liquid type and two of the powdered variety.

General Electric Co. operated a specially constructed shell mold blowing machine to demonstrate its resin coated foundry sands. GE's Chemical and Metallurgical Div. operates an experimental foundry for studying factors affecting shell and casting quality.

The American Foundrymen's Society elected Frank W. Shipley, foundry manager of Caterpillar Tractor Co., to the Presidency of AFS. Another automotive executive, R. V. Righter, plant manager for Central Foundry Division of General Motors Corp., was elected a director for a three-year term. James F. Vanick, research metallurgist for the International Nickel Co., was presented the William H. McFadden Gold Medal for outstanding contributions to the Society and for valuable service to the ferrous casting industry over many years.

## Heavy-Duty Truck Line Is Announced by GMC

An expanded line of heavy-duty trucks for both highway hauling and off-the-road operations has been announced by GMC Truck and Coach Div. of General Motors Corp. Included are tandem-axle models, and a wide variety of four-wheel vehicles with more powerful gasoline and Diesel engines.

For example, the line ranges from four-wheel gasoline models of 22,000 lb GVW to tandem-axle vehicles of 90,000 lb GCW. Several entirely new models, including an FW550 dual-purpose, tandem-axle tractor and a tandem-axle W670, are offered.

## Suppliers' Role Pinpointed In Exhibit at Ford Rotunda

Current stellar attraction for spring and summer visitors to the Ford Rotunda in Dearborn, Mich., is an animated exhibit called "Partners in Production." Dramatizing the important role of parts makers and other suppliers to the automotive industries, it is expected to draw about 1.5 million visitors before its run terminates on Labor Day.

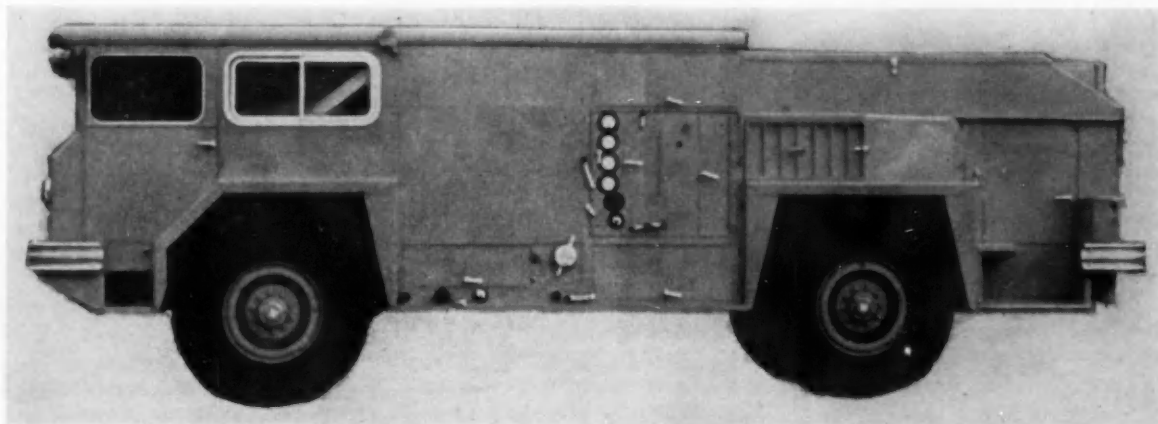
In planning the exhibit, Ford selected 52 well-known names from a group

of 7000 major suppliers for individual displays. Those chosen represent a fair cross-section of suppliers of parts, materials, and machine tools. While the 7000 names are classified as Ford's major suppliers, the company points out that it actually deals with some 20,000 altogether.

Several of the displays in the exhibit touch on notable new developments. For example, one portrays some features of producing crankshafts by the shell molding technique. Another is a perspective of an automated Landis crankshaft grinding line. It is said to represent an installation to be made in a Ford engine plant soon.

A chassis assembly line in miniature has been installed in an inner circle of the Rotunda. Encircling it is an overhead conveyor which carries parts and assemblies around it to simulate operations along a straight assembly line. Visitors can push a button and see a complete body drop onto a chassis and then return to its position overhead. By the same token, they can watch an engine drop down to a chassis and return to the conveyor.

Continued on Page 94



## POWERFUL REAR-ENGINE FIRE TRUCK IS DEVELOPED FOR ARMY ENGINEERS

Completely enclosed cab large enough to accommodate six men is one feature of a new military fire truck now undergoing tests. Developed by the Army Corps of Engineers and Walter Motor

Truck Co., it has a 300-hp rear engine, four-wheel drive with self-locking differentials, spring-supported double reduction drives, and a three-speed transmission with a specialized torque converter.



# Men in the News



Goodyear Aircraft Corp.—**T. A. Knowles** has been named president.

Ford Motor Co., Ltd.—**Sir Patrick Hennessy** has been elected chairman of the board.

Perfect Circle Corp.—**Vern C. Vanderbilt, Jr.**, has been named chief research engineer.

Lockheed Aircraft Corp.—**Clarence L. Johnson** has been named vice-president for research and development; **John B. Wassall**, director of engineering; and **M. C. Haddon**, chief engineer.

Pittsburgh Screw and Bolt Corp.—**Frank L. Sonneman** and **Howard R. Swartz** were elected vice-presidents.

Nash Motors Div., American Motors Corp.—**G. B. Stone, Jr.**, has been promoted to executive assistant, succeeding **H. G. Paxton**, now administrative assistant to the vice-president of distribution and marketing. **D. L. McLellan** has been advanced to parts and service manager.

Goodyear Tire and Rubber Co.—**Leland E. Spencer** has been appointed vice-president. **J. M. Linforth**, vice-president in charge of manufacturers' and Government sales, will retire in June and will be succeeded by **C. C. Gibson**. **Fred W. Climer**, vice-president in charge of industrial relations, will also retire in June, and **F. J. Carter** will succeed him. **Victor Holt, Jr.**, has been named a vice-president, and **R. E. Pauley** has been named general manager of the Foam Products Div.

Chrysler Corp., Defense Operations Div.—**Rudolph G. Quitmeyer** was named comptroller.

Greer Hydraulics, Inc.—**Ernest W. Marchand** has been appointed director of manufacturing.

Buick-Oldsmobile-Pontiac Assembly Div., General Motors Corp.—**Richard J. Howlett** was named manager of the Atlanta, Ga., plant.

Strick Trailers—**Sam Merion** has been named general sales manager.



Thompson Products, Inc., Accessories Div.—**John D. Stanitz** has been appointed chief engineer, and **Robert T. Hall** has been named sales manager.

Chrysler Corp., Engine Div.—**Milton E. Trueman** has been named plant manager of the Mound Road engine plant; **J. F. Anderson**, manager of production engineering; **Howard W. Hunt**, comptroller; **Donald R. Kinker**, divisional chief engineer; **Marvin G. Simmons**, purchasing supervisor; **Harry R. Bentley**, manager of production planning; **John P. Horgan**, manager of administration and organization; and **Robert J. Stevens**, manager of industrial relations.

Ford Div., Ford Motor Co.—**Walter J. Cooper** was chosen Western regional sales manager, and **William H. Klein** succeeds him as Los Angeles district sales manager. **Galen B. Price** was named associated operations manager.

Reo Motors, Inc.—**Walter Spieth** has been named vice-president in charge of manufacturing.

Wagner Electric Corp.—**J. C. Evans** was elected controller; **E. G. Holtzman**, secretary-treasurer; and **J. P. Harbacek**, assistant secretary and assistant treasurer.

Thompson Products, Inc., Accessories Div.—**Robert J. Anderson** has been made chief technical specialist; **Frederic E. Smith**, assistant chief engineer for aircraft pumps; **James C. Wise**, assistant chief engineer for systems; **James C. Osborne**, manager of aircraft engine accessories sales; and **Frank A. Flower**, manager of Government sales.

Ramsey Corp.—**J. E. Adams** will retire July 1, and **W. S. Mahoney** will succeed him as vice-president and general manager.

Fafnir Bearing Co.—**Robert W. Powell** was promoted to general sales manager.

Michigan Tool Co., Gear-O-Mation Div.—**Fred T. Proper** has been made sales manager.



Dodge Div., Chrysler Corp.—**W. Heartsill Wilson** has become Western new car sales manager, and **Louis T. Hagopian** has been chosen Eastern new car sales manager.

American Motors Corp., Automotive Div.—**C. M. Tillinghast** has been promoted to parts and service manager.

Borg-Warner Corp.—**Paul A. Barkmeier** is now director of marketing services.

Rochester Products Div., General Motors Corp.—**C. C. Brandon** has been named works manager, and **J. S. Matthews** has become production manager.

American Car and Foundry Div., ACF Industries, Inc. — **Herbert H. Rogge** has been appointed executive vice-president.

H. K. Porter Co., Inc.—**Charles L. Holbert** has been appointed executive vice-president.

General Electric Co.—**William A. Clegern** was made manager of marketing for the Jet Engine Dept.

Lewis Welding & Engineering Corp., Machine Div.—**Robert G. Keller** is now chief engineer.

Jack & Heintz, Inc.—**John L. Whiteman** is now manager of the Technical Advertising and Data Dept.

Pittsburgh Plate Glass Co., Fiber Glass Div.—**Robert A. McLaughlin** is now general manager.

Reynolds Metals Co.—**Alex B. McLennan** was made market manager for the automotive market of the aluminum fabricating service.

Thompson Products, Inc., Valve Div.—**William F. Saefkow** is now manager of the Detroit district office.

Van Norman Automotive Equipment Co.—**Philip D. Moulton** was made general sales manager.

Consolidated Electrodynamics Corp.—**Ahler P. Stuhman** was made director of quality control.



Goodyear Aircraft Corp.—**Val L. Follo** has been named vice-president in charge of production.

American Brake Shoe Co.—**Stephen S. Conway** was named a vice-president.

Borg-Warner Corp.—**Robert S. Ingersoll** was elected president, succeeding **Roy C. Ingersoll**. The latter was re-elected board chairman and named chief executive officer. **Lester G. Porter** was made executive vice-president; **Albert Steg**, financial vice-president and treasurer; and **Robert W. Murphy**, vice-chairman of the executive committee.

American Bosch Arma Corp.—**Sidney E. Miller** was named vice-president and general manager of the Springfield, Mass., division.

Chrysler Corp.—**Emlyn Lloyd** has been made operating head of purchasing activities.

Kaiser Aluminum & Chemical Corp.—**Andrew F. Kritscher** has been appointed manager of engineering.

Aeroquip Corp., Marine Sales Div.—**Victor Emery** was made manager.

Pennsylvania Salt Manufacturing Co.—**Joseph J. Duffy, Jr.**, has been appointed manager of executive procurement and development.

Joy Manufacturing Co. — **A. B. Drastrup** has been appointed vice-president.

Warner Lewis Co.—**Steven B. Wilson** was made honorary board chairman and **J. Norman Fitzgerald**, president, succeeding **Warner Lewis**, now chairman of the board.

Fram Canada, Ltd.—**Frederick A. Knight** was named president; **Charles B. Benton**, vice-president in charge of sales; and **Paul Hartz**, vice-president and treasurer.

Snyder Tool & Engineering Co.—**Charles J. Craft** was made service manager.

Esso Research and Engineering Co.—**Will W. White** has been elected a vice-president.

General Motors Acceptance Corp.—**Allen S. Brush** and **James J. Hanley** have been elected treasurer and controller, respectively.

Scovill Manufacturing Co.—**S. T. Williams** has been named a director.

Nash Motors Div., American Motors Corp.—**John S. Krider** was made administrative manager, and **Robert M. Eddins** has been chosen parts and service promotion manager.



*Timken Roller Bearing Co.—James Freese and Charles L. Richey have been named general production manager and assistant general production manager, respectively, for all plants.*

Kaman Aircraft Corp.—**Edward J. Odum** has been elected senior vice-president; **Charles Kirchner**, vice-president for industrial and public relations; **Edward G. Conway**, vice-president and works manager; **John O. Emmerson**, vice-president and chief engineer; and **Robert L. Field**, assistant secretary.

Janitrol Aircraft-Automotive Div., Surface Combustion Corp.—**F. H. Scott** has been promoted to eastern regional manager; **L. A. Curtin**, western regional manager; **Phil A. Miller**, product manager for liquid heaters; and **M. E. Meske**, staff engineer.

Lear, Inc., Aircraft Engineering Div.—**Vernon B. Benfer** has been appointed division general manager.

General Tire & Rubber Co.—**Anthony D. Eastman** was named director of industrial relations.

Fairchild Aircraft Div., Fairchild Engine & Aircraft Corp.—**Louis Fahnestock** was appointed director of projects administration.

Flintkote Co.—**Dennis J. McNamara** has been elected vice-president and controller, and **William Feick, Jr.**, has been elected treasurer.

Borg-Warner Corp.—**W. E. Lang** has been named director of industrial relations for the Long and Detroit Gear Divs.; **W. E. Rowe** succeeds him as manufacturing manager at Long Div.; **L. W. Cartier** moves up to the post of manager of quality control of both the Long and Detroit Gear Divs.

Solar Aircraft Co., Engineering Div.—**Dr. Erwin O. A. Naumann** has been named chief of advanced studies.

Anchor Steel and Conveyor Co.—**Harold A. Rieth** has been appointed assistant treasurer.

Pressed Metals of America, Inc.—**Edmund West** is now vice-president in charge of manufacturing; **Donald J. Clark**, sales manager; and **Louis J. Aure**, chief engineer in charge of new products and design.

*(Turn to page 94, please)*

## Necrology

**Frederick B. Rentschler**, 68, chairman of the board of United Aircraft Corp. and founder of the Pratt & Whitney Aircraft Div., died April 25, at Boca Raton, Fla.

**James M. Talbot**, 73, executive vice-president of S. S. White Dental Manufacturing Co., died April 23, at Dongan Hills, N. Y.

**George W. Kiernan**, 68, one of the designers of the first Dodge automobile, died April 19, at St. Petersburg, Fla.

**John H. Clarke**, 73, former assistant secretary of Hudson Motor Car Co., died April 25, at Detroit, Mich.

**William A. Thompson**, 79, a retired vice-president and secretary of Allis-Chalmers Mfg. Co., died April 25, at Milwaukee, Wis.

**Walter Faulkner**, 36, veteran Indianapolis Race driver, was killed April 22, at Vallejo, Calif.

**Ernest McAfee**, 37, one-time Pan American Road Race driver, was killed April 22, at Pebble Beach, Calif.

**Henry J. Fuller**, 82, a former vice-president of Fairbanks, Morse & Co., died recently, at New York, N. Y.

**Reginald T. Murphy**, 60, controller for the Chevrolet Livonia and Willow Run truck plants, died April 20, at Grosse Point Park, Mich.

**George McClellan**, 57, director of the Nylon Manufacturing Div. of the Textile Fiber Dept. of Du Pont Co., died April 15, at Wilmington, Del.

**Rolland H. Mogle**, 50, assistant production engineer at Electric Auto-Lite Co., died April 23, at Toledo, O.

**Oscar L. Arnold**, 67, retired automobile industry executive, died April 24, at Asheville, N. C.

**Shafto H. Dene**, 58, senior vice-president of Kudner Agency, Inc., died April 15, at Chappaqua, N.Y.

**Raymond L. Schonbachler**, 51, sales-office manager for Vinco Corp., died April 17, at Detroit, Mich.

**Harry L. Horton**, 69, former Chevrolet Eastern Zone executive, died April 29, at Garden City, N. Y.

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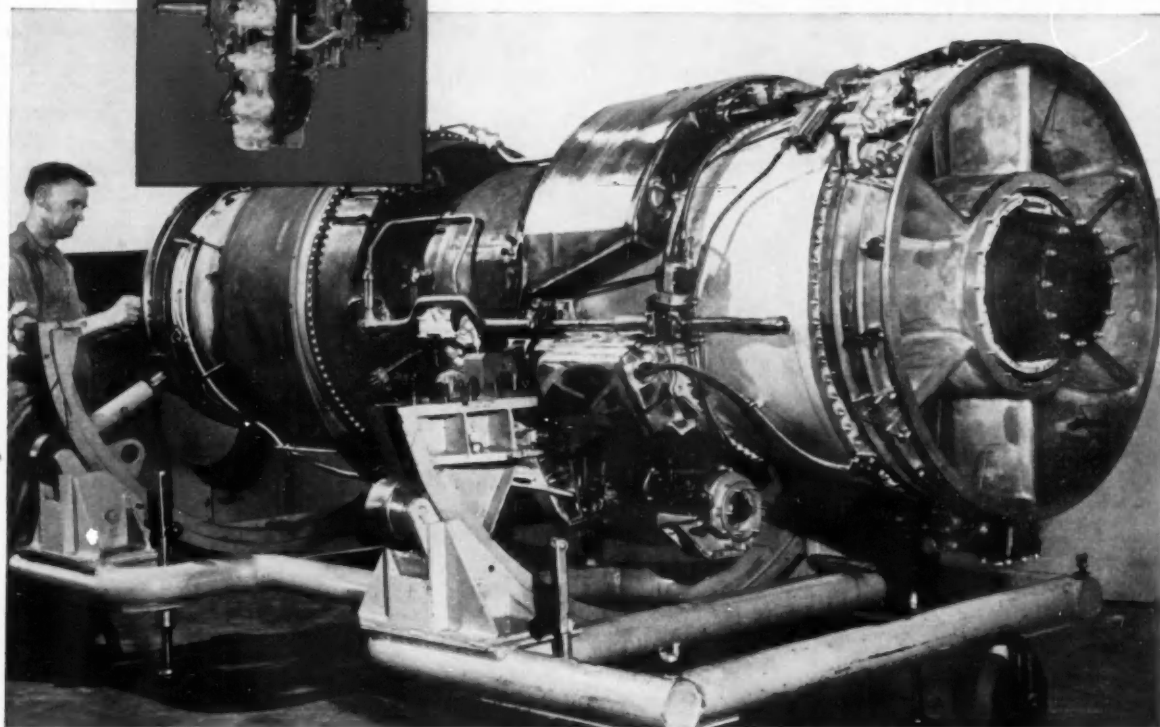
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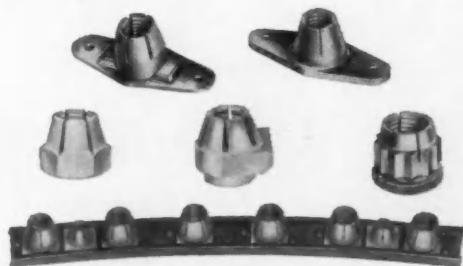
## More than 25 years of engine development and the fasteners are still by ESNA

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# How flange surface conditions affect gasket compression

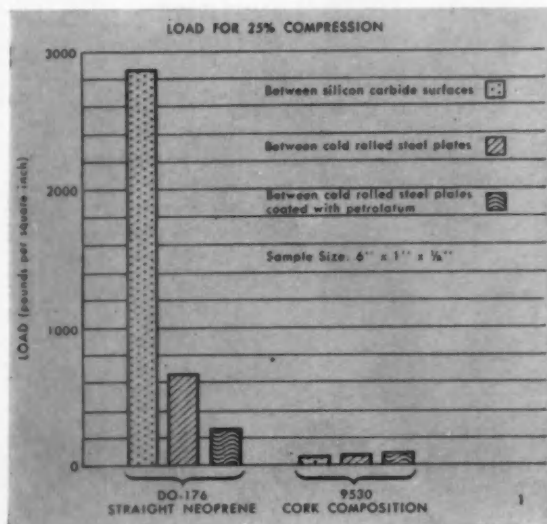
Some manufacturing processes deposit grease or oil on flange surfaces—others leave these surfaces smoothly finished. Naturally, under such varying conditions, certain types of gaskets may show unexpected load-compression characteristics.

Non-compressible rubber materials, for instance, slip badly on greasy or smooth surfaces. Thus grease, cutting oils, or a wet gasket cement can upset load calculations based on dry rubber placed between clean, non-skid plates. Compressible materials, however, are much less affected by slick conditions on flange surfaces.

Figures 1 and 2 show the comparative behavior of four different resilient materials under different surface conditions.

## rubber gaskets

The first of these materials, Armstrong DO-176, (Fig. 1) is a straight neoprene compound. It requires a load of over 2,800 psi for 25 per cent compression



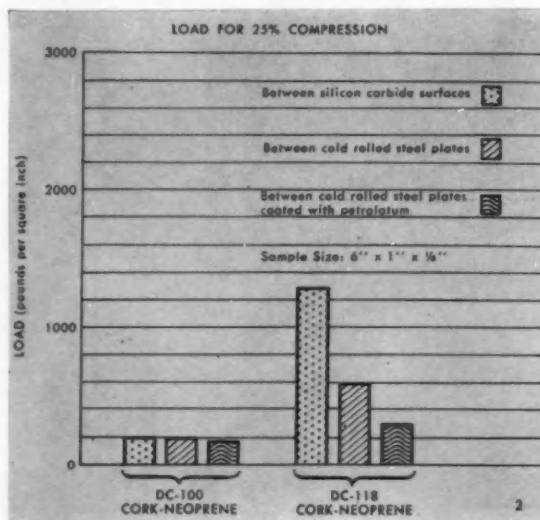
when gripped between rough ceramic surfaces. Between cold rolled steel plates coated with petrolatum, the load required for the same deflection drops below 250 pounds. Even without a lubricant, skid on smooth steel surfaces reduces the load required to slightly more than 600 pounds.

## cork composition

With cork composition, a truly compressible material, varying surface conditions have little effect. As shown in Figure 1, Armstrong 9530 Cork Composition compresses 25 per cent with nearly the same load on a greasy surface as on a rough, dry surface. Maximum load variation is only about 3 pounds.

## cork-and-rubber

By combining cork and rubber in varying amounts, compositions can be made whose behavior on slick surfaces falls between that of straight cork and that of straight rubber. Armstrong DC-100, for example,



is a neoprene composition with a high cork content. As shown in Figure 2, load for 25 per cent compression on a greasy surface (160 psi) is only slightly less than on a rough surface (200 psi). On plain rolled steel plates, no slippage at all is evident.

Armstrong DC-118 (Fig. 2), on the other hand, contains relatively little cork. Load for 25 per cent compression drops from about 1,300 pounds on rough surfaces to 600 pounds for smooth steel plates. The same plates, coated with petrolatum, further reduce load to about 300 pounds. Other Armstrong cork-and-rubber compounds produce intermediate degrees of compressibility to meet particular needs.

## SEND FOR 24-PAGE GASKET DESIGN MANUAL

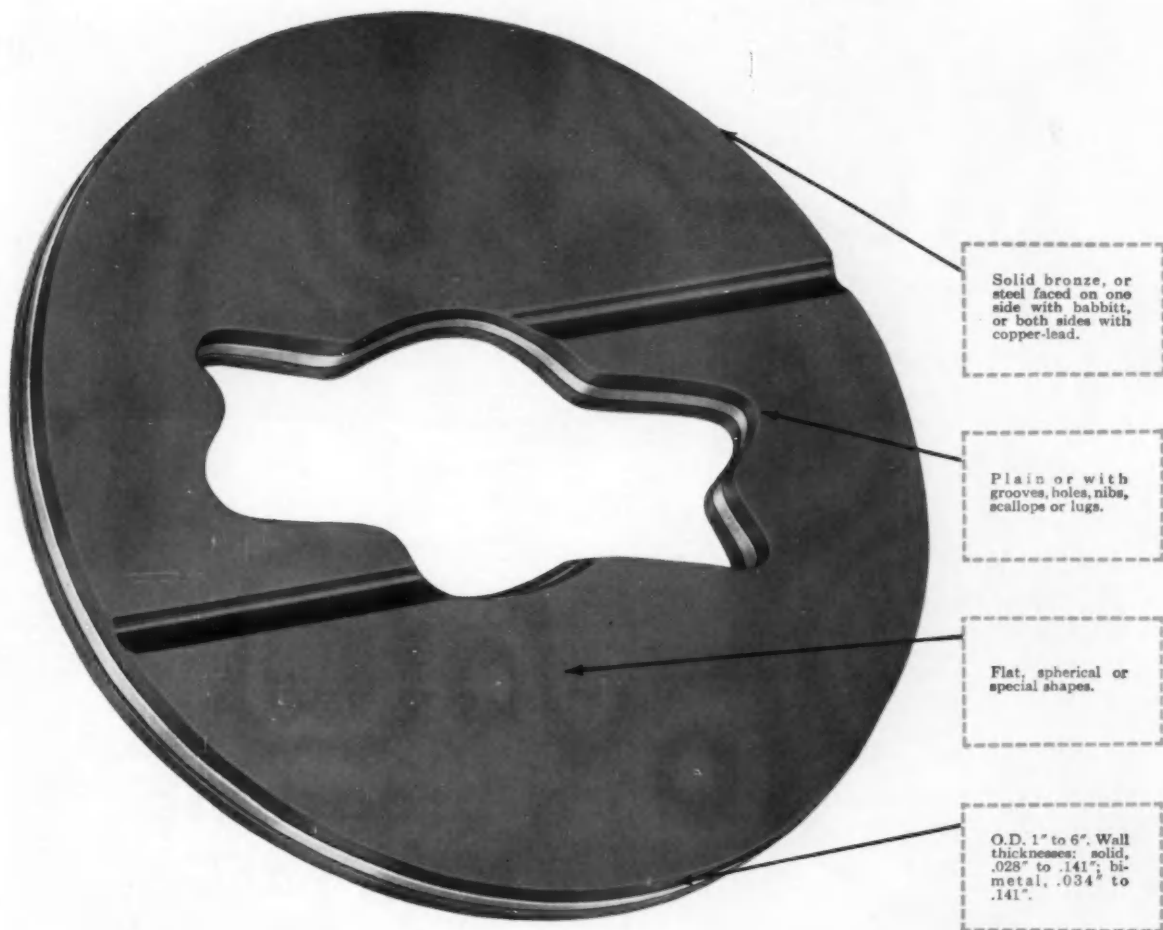
You'll find other useful information on the design and use of gaskets in the new Armstrong Gasket Design Manual. Write for your copy to Armstrong Cork Company, Industrial Division, 7105 Imperial Avenue, Lancaster, Pennsylvania. For information on all Armstrong Gasket Materials, see Sweet's product design file.



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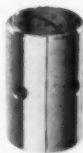
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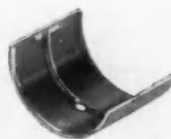
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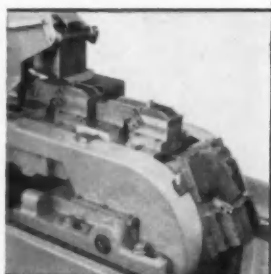


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# Special Equipment for Making Crankshafts, Pistons and Rods

## *at American Motors Plant*

**N**EWEST of the V-8's, the distinctive AMC, is being produced at the American Motors Plant in Kenosha. A preliminary article dealing with a sampling of operations on the cylinder block and head for this engine appeared in AI, May 1, 1956. This article covers additional sampling on a number of the smaller components, including connecting rods, crankshafts, and pistons.

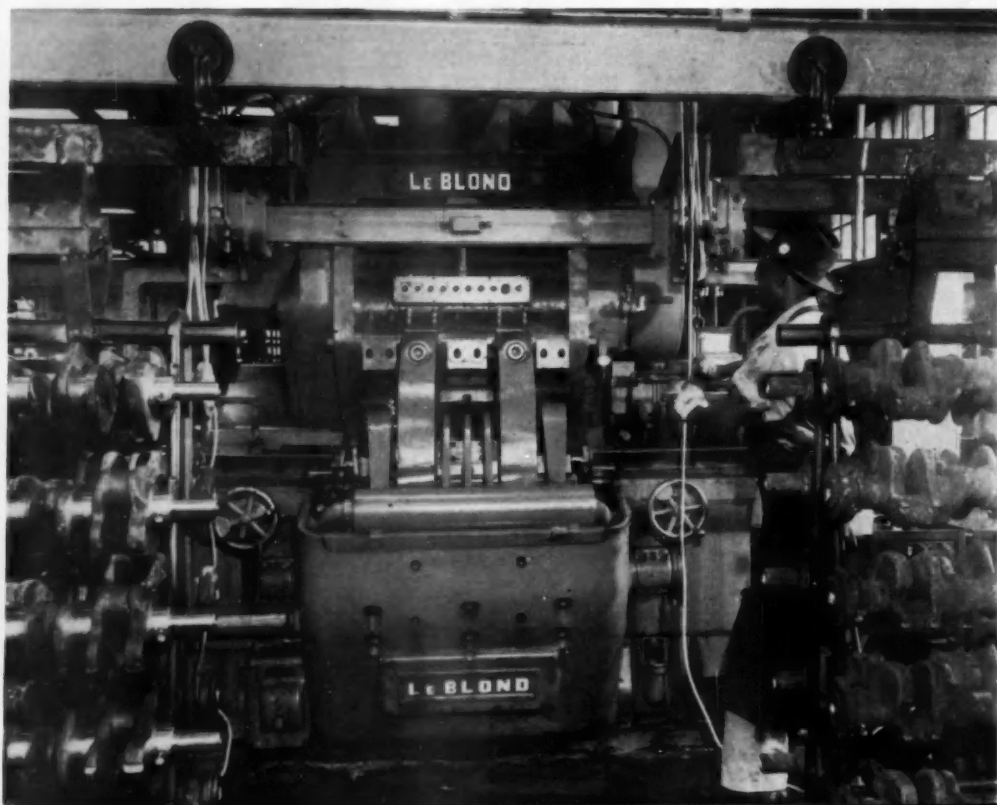
### CRANKSHAFTS

The five-bearing crankshaft used in this engine is drop-forged with integral full counterweights of massive proportions. First operation is the milling of a number of locating spots in a Sundstrand Rigidmil. A group of three LeBlond No. 1-IB crankshaft lathes (Fig. 1) is employed for rough- and finish-turning of main bearings,

stub and flange end, and necking of main bearing diameters. These are the familiar center drive lathes, fitted with built-in mechanism for loading and unloading the work.

A group of two No. 6 AC LeBlond lathes, provided with a central fixture for holding two crankshafts at a time, are tooled for rough-turning pins and cheeks; while another battery of two lathes does the finish-turn-

**FIG. 1—One of a group of No. 1-IB LeBlond center drive crankshaft lathes for rough- and finish-turning of the main bearing line. The mechanism for automatic loading and unloading may be seen on both sides of the machine.**





By  
**Joseph  
Geschelin**

**FIG. 2—Arrangement of Avey torque-controlled sensitive drill heads, for drilling crankshaft oil holes.**

ing of the same surfaces. These machines are manually loaded and unloaded.

Drilling and chamfering of oil holes is done with a battery of two, four-head Avey sensitive drilling machines, equipped with torque controlled drill heads (Fig. 2).

Chamfering of the edges of the counterweight cheeks (Fig. 3) is done in a 12A Sundstrand automatic lathe. It has three heavy tool holders on the front and back slides for this purpose.

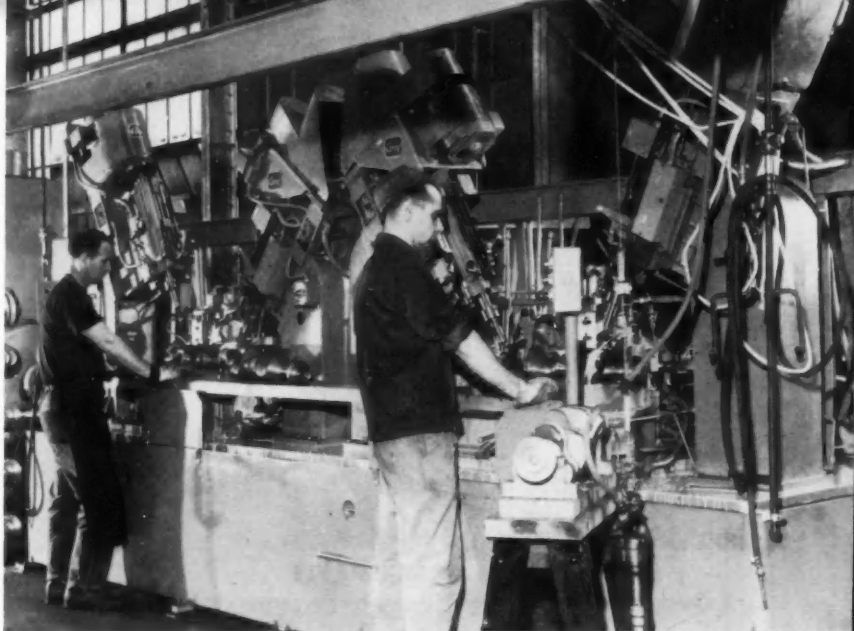
Shafts then are straightened and proceed through a series of grinding operations. Among these are two operations in Norton 30-deg angular head grinders—one for finish-grinding the gear fit, pulley fit, and thrust face; the other for grinding the flange diameter face and hub diameter.

It is necessary to finish the counterweights to a special profile designed to provide the necessary clearance with piston skirts. This profiling operation is performed in a special Crankshaft Machine Co. lathe.

Another interesting special machine is the six-station, double-end Natco (Fig. 4) with its cluster of spindles for drilling and tapping holes in the flange and pulley end, and facing the stub end to length.

At the end of the line is a dis-

**FIG. 3—Chamfering of edges of counterweight cheeks is done in this massive No. 12-A Sundstrand automatic lathe. The front tools may be seen mounted on the angularly-mounted front slide.**



## CRANKSHAFTS

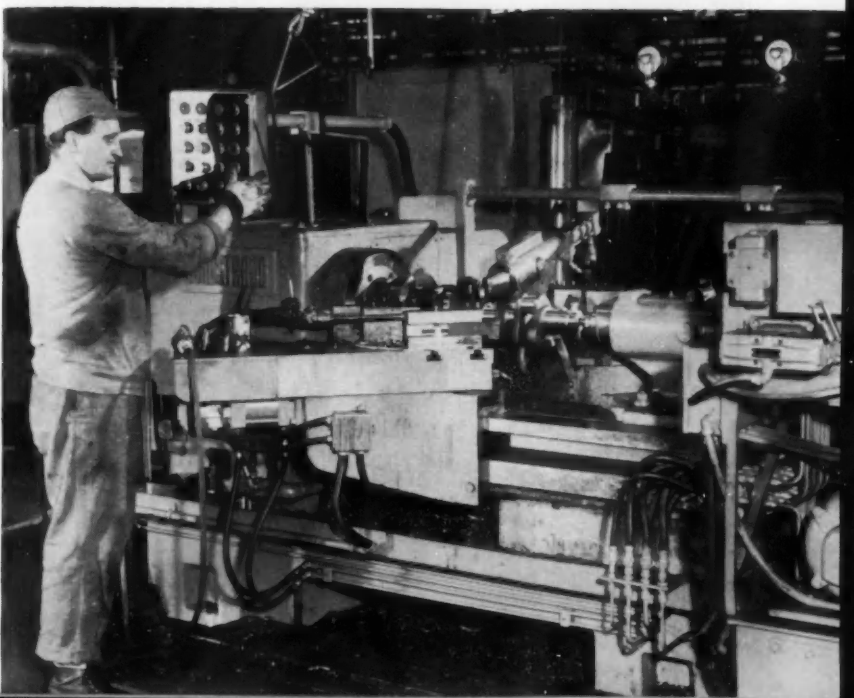
tinctive piece of equipment supplied by Gisholt (Fig. 5). The first stage is a Gisholt Dynetric balancing machine, combined with a four-head Leland-Gifford automatic depth drilling attachment. The function of this machine is to effect an established and controlled amount of radial unbalance, rather than to balance to a given tolerance range.

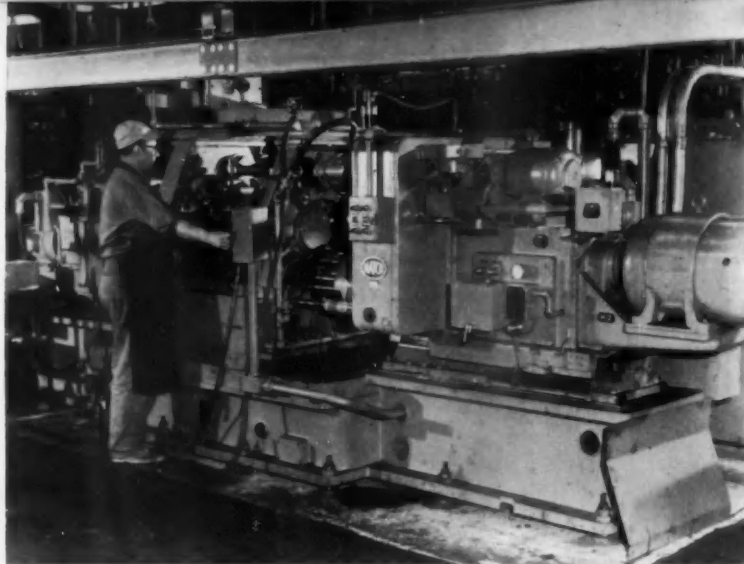
Directly behind the balancing

equipment and connected with it by automation is a Gisholt Superfinisher for superfinishing the main bearings and pins. The entire cycle is automatic once the operator has placed a crankshaft in the balancer station.

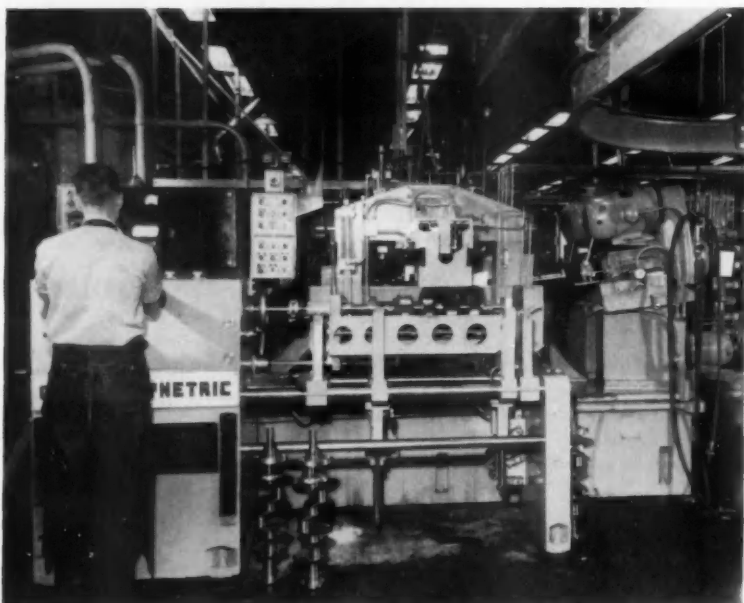
Final operation is a complete inspection of all critical dimensions, using the large Sheffield Precisionaire machine seen here (Fig. 6). This machine has 34

## CRANKSHAFTS





**CRANKSHAFTS**



**CRANKSHAFTS**



**FIG. 4—Six - station, double - end lathe, seen here, does the drilling and tapping of holes in the flange end and facing the stub end to length on the opposite side.**

gaging points to cover the gamut of diameters, widths, spacing, and taper readings. Operation of this device is automatic, providing simultaneous readings on all columns.

## PISTONS

Pistons are machined in successive steps in a variety of machines to be described briefly at this point. These Bohnalite aluminum alloy pistons are received in rough-turned form from the supplier. The first operation on the line is in a Hartford Special machine (Fig. 7), fitted with two radially-mounted heads and a horizontal head. In one setting this machine performs the fol-

**FIG. 5—Crankshafts are balanced in the Gisholt Dynetric by this balancer. Some of the Leland Gifford balance drilling heads may be seen at the right. Directly behind the balancing machine, and connected by automation, is a Gisholt Super-finish for polishing all pins and journals.**

lowing operations: rough bore the piston pin holes; rough- and finish-bore the skirt; rough- and finish-bore the weight bosses; rough- and finish-face and chamfer weight bosses.

Next major operation (Fig. 8), is in a six-station Baird chucking machine tooled for rough- and finish-turning ring grooves; rough- and finish-turning lands; and finish-turning and chamfering the top.

Following the drilling of smoke holes and oil holes, the piston goes to the special Morris weight-milling machine. As illustrated (Fig. 9), the work passes automatically over a Shadograph sensitive weighing station which sends instructions to the adjacent milling station as to the amount of metal to be re-

**FIG. 6—Thirty-four critical dimensions on crankshafts are gaged simultaneously in this Sheffield Precisionaire machine.**

**FIG. 7—First operation on the rough-turned pistons is the series of boring operations on the piston pin hole, skirt, and weight bosses. These are done in one setting in the Hartford Special machine illustrated.**

moved. Weight is held to plus or minus two grams.

Pistons then proceed to a group of two, No. 233 Heald Bore-Matics (Fig. 10), each fitted with two chucking stations. The operations include finish-turning of the skirt, and finish-boring of the piston pin hole.

Pistons then are washed, inspected, tin-plated, and the pin holes Bearingized. Final inspection and grading is handled with a compact Federal electronic amplifier cabinet. It gages automatically, sorting pistons into six acceptable grades; and over- or under-size. It also checks for taper.

**FIG. 8—This six-station Baird chucking machine handles the rough- and finish-turning of ring grooves and lands; finish-turning and chamfering the top of the piston.**

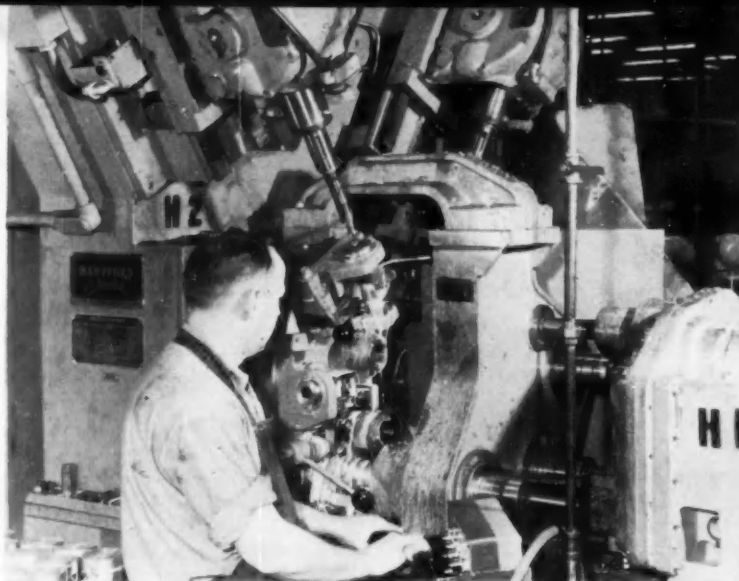
## RODS

The drop-forged connecting rods are forged integrally with the cap, the latter being parted later on. First operation is rough-grinding of both sides in a No. 24A-2, two-wheel Mattison surface grinder (Fig. 11). Bolt boss sides and tops on the big end are finished to size by surface broaching in a Cincinnati vertical Duplex surface broaching machine.

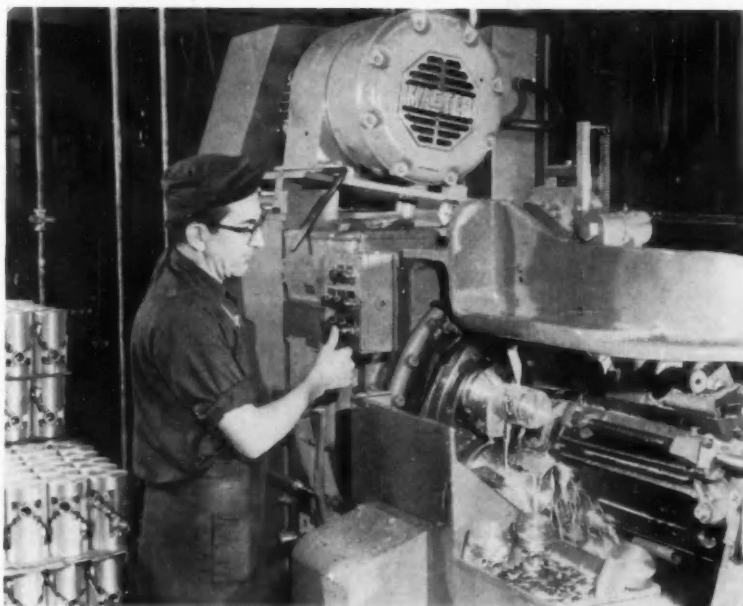
A distinctive piece of equipment is the special Greenlee drilling machine, fitted with a large triangular-shaped fixture holding six rods at each side. Two banks of double spindles drill and ream the piston pin end from the solid, and drill the oval-shaped bore in the large end in two steps.

*(Continued, next page)*

**FIG. 9—Special Morris piston weight-milling machine which holds weight tolerance to plus or minus two grams. The automatic Shadograph weighing station may be seen directly in the foreground.**

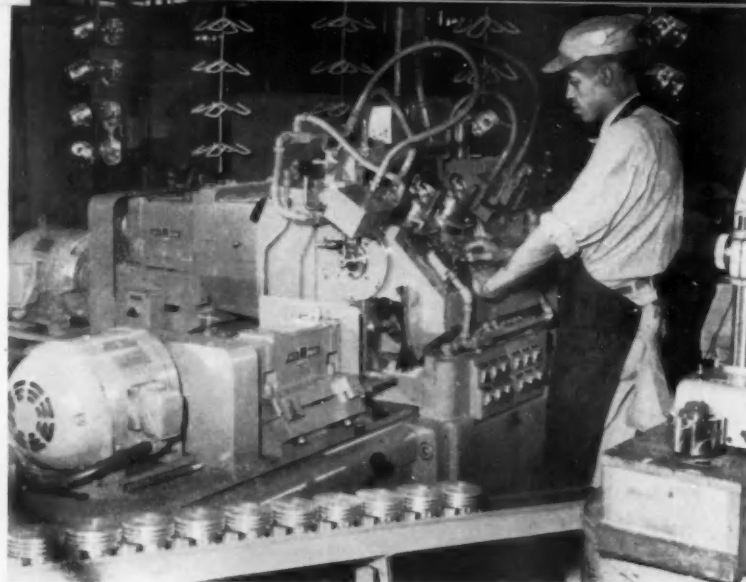


**PISTONS**



**PISTONS**

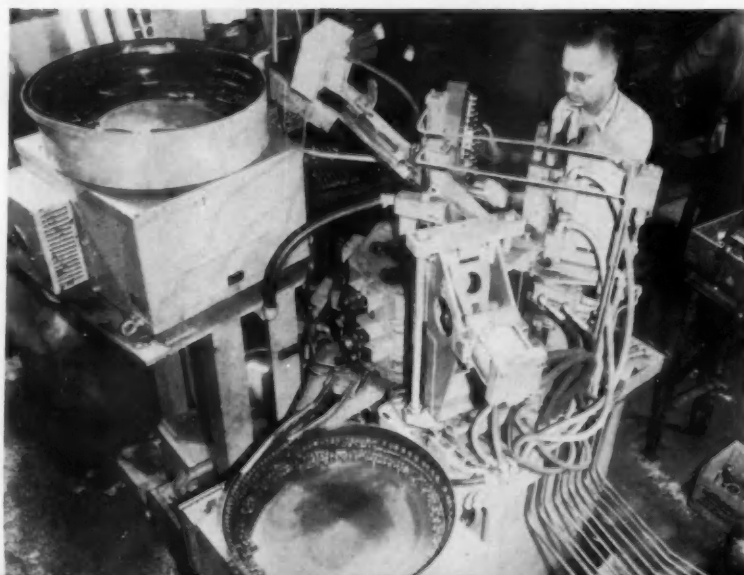




▲ PISTONS ▲



▲ CONNECTING RODS ▼



**FIG. 10—Finish-turning of the piston skirt and finish-boring of the piston pin hole are done in No. 233 Heald Bore-Matics, fitted with two chucking stations.**

The pin hole is broached in a vertical American broaching machine. Then follow operations in two vertical Duplex Cincinnati surface broaching machines. The first one cuts off the cap. In the second, the cap and rod have the half-round and parting joint face finished.

Following some additional operations we reach an extremely noteworthy piece of equipment—the Impco automatic assembly machine. It is a compact six-station machine (Fig. 12), for pressing-in the bolts and assembling the nuts. The operator installs the rod and cap manually in the fixture but from that point on the cycle is fully automatic. Bolts are fed in, two at a time, from the over-head-mounted Syntron and pressed into place. Nuts are fed in, two at a time, from the Syntron at the side in

**FIG. 11—One of the Mattison surface grinders employed in the connecting rod department.**

the rear of the machine and tightened automatically.

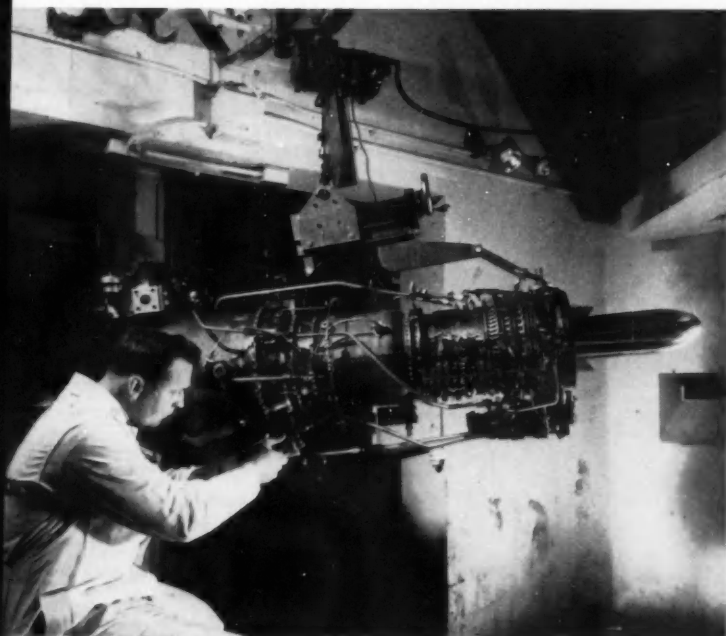
Following this both sides of the rod assembly are finish-ground in another No. 24A-2 Mattison surface grinder; and the bores rough- and finish-bored in a Simplex machine. The rod assemblies then are given an automatic weight balance in the familiar Motch & Merryweather machines.

Final operation is the honing of the large and small ends in separate settings in Micromatic honing machines.

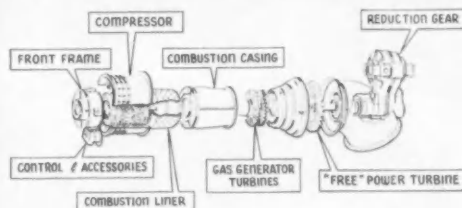
One of the most unique operations, although it is quite unobtrusive, is the method for making up the piston and rod assembly (Turn to page 190, please)

**FIG. 12—Overhead view of the Impco connecting rod assembly machine. Its function is to press in the two bolts, add the nuts, and tighten automatically. Bolts are fed from the Syntron at the left down to the station at the right. Nuts come in on double tracks from the Syntron in the foreground.**





The new General Electric T58 turboshaft engine



Axial flow arrangement of components in the GE T58 turboshaft engine

## **New** **General Electric** **Turbojet**

***Develops 1050 Shaft Horsepower***

***and Weighs Only 250 Pounds***

### **CONDENSED ENGINE SPECIFICATIONS**

Weight	250 lb
Reduction gear	75 lb
Specific weight (basic engine)	0.24 lb/hp
Over-all length	59 in.
Diameter (max flange)	16 in.

### **ENGINE DESCRIPTION**

**Compressor**—axial-flow, high performance

#### **Combustor**

Straight-through, full annular combustor  
Outer casing split in two 180 deg segments for easy inspection  
Sixteen fuel nozzles (eight on each of two manifolds) mounted on front of inner liner  
Ignition with one capacitor discharge type igniter—operated only during starting cycle

#### **Gas Generator Turbine**

Two-stage, axial-flow turbine directly coupled to compressor rotor  
Cooling provided by bleed air from compressor

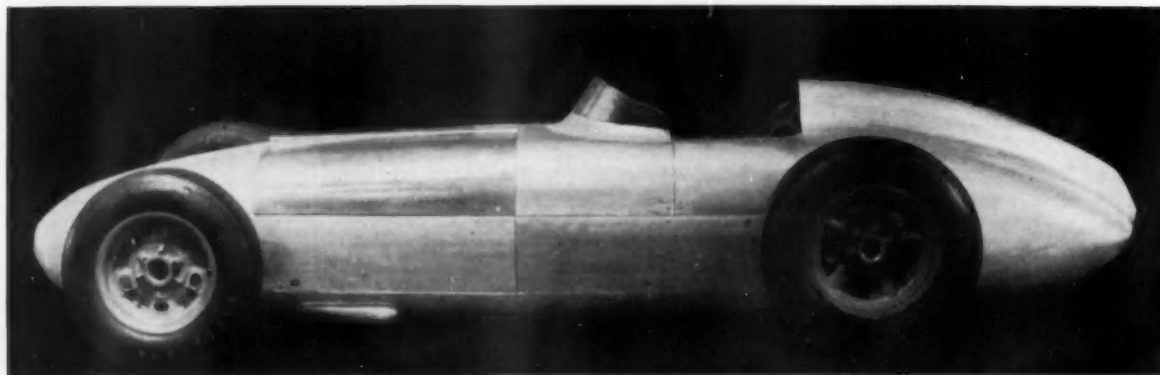
#### **Power Turbine**

Single-stage, axial-flow turbine mechanically independent of gas generator  
Worm gear shaft for governor and tachometer-generator speed sensing shaft

**D**ESIGNED and developed by General Electric's Small Aircraft Engine Department for the Navy's Bureau of Aeronautics, the T58 turboshaft engine is less than five feet long and 16 in. in diameter. Specific fuel consumption is said to be 0.69 lb/hp hr at normal rating. While the initial application is to power helicopters, the T58 can be used for various other aviation and non-aviation applications. In addition, it can be modified to be a power plant for fixed-wing aircraft either as a turboprop or turbojet.

The T58 produces 1024 shp at military rating and weighs 325 lb with reduction gear. Without reduction gear, it produces 1050 shp and weighs 250 lb. This is believed to be the highest power-to-weight ratio so far announced in the small engine field.

For helicopter applications, the T58 constant speed control replaces manual control with automatic control and relieves the pilot of the major duty of trimming power to set rotor speed. It provides automatic load division between engines in multi-engine installations with reset trimming adjustment seldom necessary, and permits rapid engine response to maintain essentially constant rotor speed under load conditions. The speed control provides a means for resetting the rotor speed when major changes in flight altitudes are made.



New lightweight body of the 1956 Watson-built John Zink Special. The sheet aluminum is only 0.051 in. thick, and several of the panels are made of sheet magnesium. Ellis H. Roark photo.

**G**ENTLEMEN, start your engines!" This clarion call will send the buzz boys off on the 40th annual running of the 500-mile International Classic at the Indianapolis Motor Speedway, May 30.

What's new at Indianapolis this year? Will there be a new speed record? How will the Ferrari and the two Novis do? Will it be

## New Engines and Cars for the Indianapolis 500

By  
**R. Raymond Kay**

another Meyer & Drake derby?

To try to get the answers to these and many more questions, your reporter travelled 1500 miles to talk to race car designers, builders, drivers, and mechanics. Here's their thinking, and a preview of what the 175,000 racing enthusiasts will see at the jam-packed Speedway.

Average speed for the race will be 135 mph; and it will take a sizzling 140 mph average qualifying speed to get into it. This, of course, is barring accidents, and with favorable weather and track conditions.

Tony Hulman, owner of the Speedway, predicts one of the safest, most exciting, and probably the fastest race ever. He spent over \$100,000 to improve 1.7 miles of the 2.5-mile course, resurfacing the turns and both straightaways with asphalt. Great care was taken to make the surface as smooth as possible. New safety guard rails on the curves are now in place.

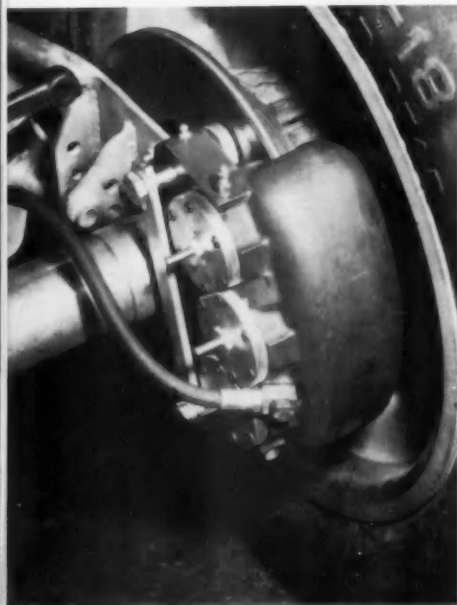
Incidentally, you lucky ticket holders, be sure to see the new

museum located at the main entrance to the ground. It houses some of the cars and mementos of the Speed Classic.

Fifty-nine cars will battle for the 33 starting positions. The Meyer & Drake 4-cyl Offenhauser 270 cu in. engine will certainly power at least 28 of the starters. Last year, and in 1954, too, all 33 qualifiers mounted Meyer & Drakes. Anticipated rule changes kept the company from making any important modifications this year.

However, four strong contenders appear on the horizon to do battle with the "Offie"-powered cars. Two new rear drive Novis, Kurtis-Kraft 500-F's, will carry the well-known, powerful 183 cu-in., 8-cyl, supercharged Novi engines. They should go like a bomb.

The Novi engines still command plenty of respect in the racing



Triple spot brakes of the type shown will be used on the rear wheels of a half dozen cars. The three protruding pins are automatic brake adjustment shanks.

fraternity as the most powerful engines ever to show up at Indianapolis.

Chief mechanic Jean Marcenac reports the engines, fitted with new crankshafts, developed 600 hp on the dynamometer. He mounted connecting rods side by side on the crankpins. The crankshaft is of the single-plane type. He needed new crankcases to incorporate a smaller bell housing, thus giving the driver more foot room. The only other changes were those necessary to turn the engine around for a rear drive. Marcenac converted a down draft carburetor to side draft for additional hood clearance and repositioned the supercharger outlet manifold.

Willie Utzman is readying a Studebaker V-8 for one of Lindsey Hopkins' cars. A great deal of money and engineering time went into achieving a reported phenomenal horsepower. If the engine's ready in time, it ought to make things hot.

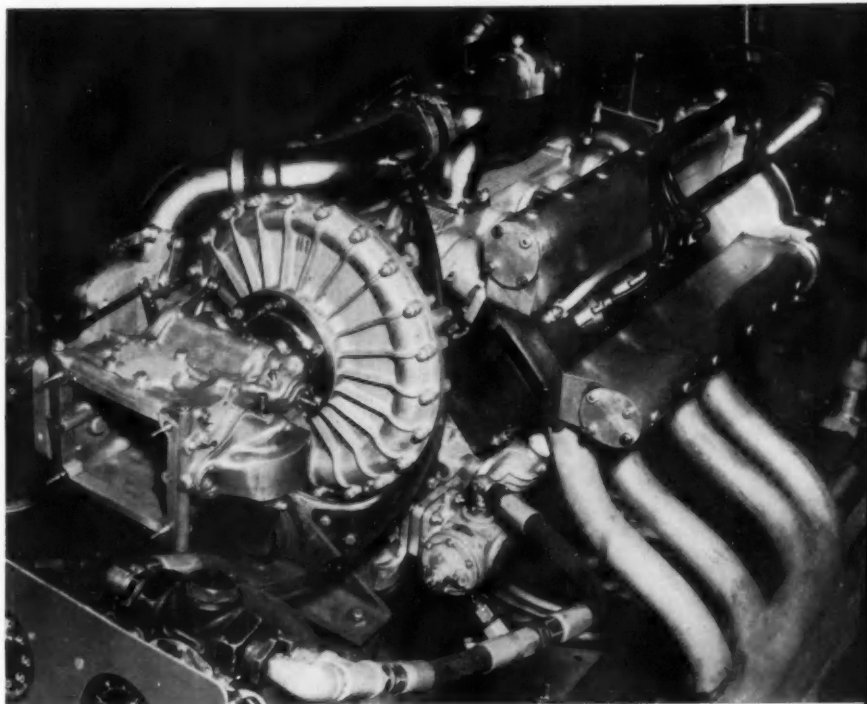
And a 6-cyl Bardahl-Ferrari, driven by world-famous Nino Farina, should give the most competitive drivers a real run for their money.

For the statistically minded: 4-cyl cars dominated the 500-mile grind in recent years; no 8-cyl car has finished the race since 1948; no 8-cyl car has led the race since Rex Mays gave up first place to Lee Wallard on the 36th lap in 1949; and no 6-cyl car has led the race since George Robson won in 1946.

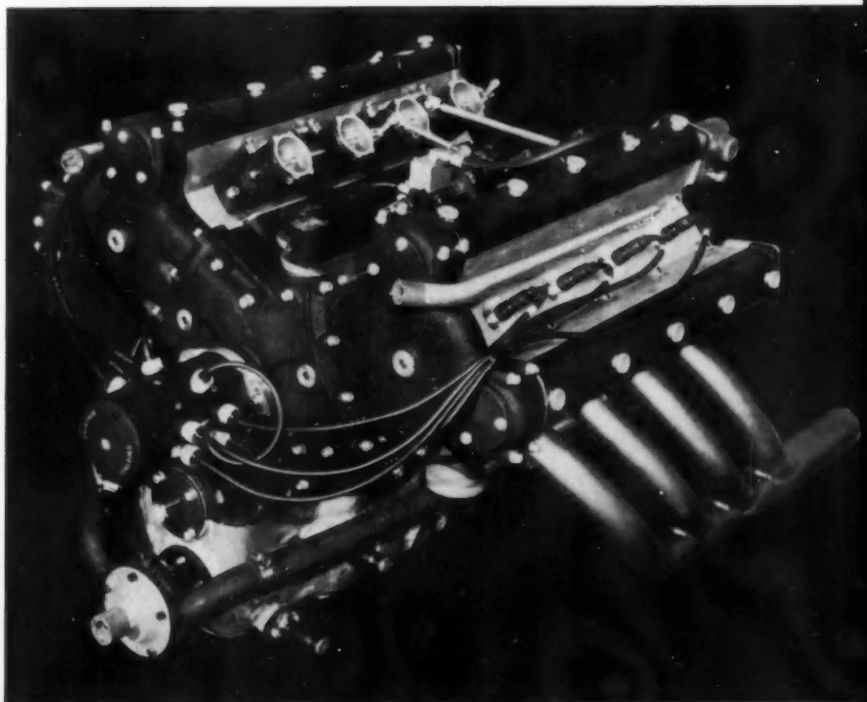
Once again, Kurtis-Kraft-built cars — about 25 of them — will start. This year Frank Kurtis built two new Series F Novis and two Series 500-G's, one for George Bignotti, San Francisco, the other for Youngstown Mack Truck Sales Co.

Kurtis also rebuilt the body of the car in which Billy Vukovich lost his life in last year's race. Incidentally, examination after the accident showed no major damage to the Kurtis-Kraft chas-

AUTOMOTIVE INDUSTRIES, May 15, 1956



The Novi V-8 racing engine which is said to develop 600 hp. Changes have been made in the induction system to permit turning the engine around to a different position in the new Kurtis 500F chassis.



Modified Studebaker engine with overhead camshafts. It will power one of the Lindsey Hopkins cars.

## New Engines and Cars

for the

### INDIANAPOLIS 500

... Continued

sis. This is certainly a fine tribute to the builder.

A trend in chassis design is to narrower cars—as much as five inch. Drivers say the narrowness seems to give them improved visibility and the reduced size induces a feeling of better control.

Several cars are changing the position of their oil tanks—mounting them outside the car, on the left. By taking advantage of the air stream, the oil in the tank gets better cooling. And, too, the added weight on the left side tends to stabilize the car on left hand turns.

A new supercharged Italian-built Ferrari engine, in a Kurtis-Kraft 500-D, plus the experienced driving of Nino Farina, adds up to a hot contender. The Bardahl-Ferrari experimental car, not ready in time for last year's race, is now all set to go. If it wins a starting position, it will be the first foreign-powered car to race at Indianapolis since 1952.

The 6-cyl Ferrari engine displacement is 269.26 cu in.; engine bore and stroke, 4.015 in. by 3.543 in.; compression ratio, 10.3:1.

Nino Farina will add lots of zip to the race. At 49, probably the oldest driver entered in this year's race, he's a veteran of 30 years of racing throughout the world.

Several Ferrari factory-trained mechanics will make the trip to Indianapolis, and a spare engine will come along with the car just in case.

Keep an eye on the two Novis. The same 183-cu-in. engines are in new Kurtis-Kraft 500-F chassis. After years of front drives, Lew Welch will try rear drives.

## RULE CHANGES?

ANY MINUTE, now, the long-awaited new formula for the 1957 race should be posted. What will it be?

AUTOMOTIVE INDUSTRIES interviewed two top men connected with the Memorial Day Classic: Tony Hulman, owner of the Speedway, and Lou Meyer, three-time winner at Indianapolis, and maker of the old standby Offenhauser 270 cu in. engine.

Tony Hulman says he looks for a good working agreement on engine sizes with the Federation Internationale de l'Automobile. And he hopes the new rules will permit stock-type engines. He'd like to see the Memorial Day Classic run "near the European 2.5- or 3-litre formula."

Lou Meyer, vice president, Meyer & Drake Engineering Corp., Los Angeles, agrees it's quite a problem to keep everybody happy. Meyer says, "We welcome any rule changes that will spark racing. And we'll certainly go along with them. All we ask is enough time to catch up with the new rules."

If engine displacement is reduced to 180 cu in., look for Meyer & Drake to design a new engine from scratch—4-cyl, with an aluminum block.

There's talk that Mr. Welch will use two drivers for each car, possibly one a daredevil and the other a conservative driver. But no matter what the driving arrangement is, watch these cars. They should give a good account of themselves.

Here's a comparison of new and old Novis:

New	Old
98 in. wheelbase	106 in.
175 in. overall length	177 in.
34 in. body width	37 in.
28 in. height at cowl	32½ in.
36 in. overall height	36 in.
at headrest (no headrest)	
4½ in. ground clearance	4½ in.
1900 lb dry weight (approx.)	2200 lb

New design features of the cars: Each has an aluminum dorsal fin. It starts at the headrest and extends back beyond the rear axle to 37 in. above track surface. Major portion of frame and suspension weight is below the wheel center. This lowers the center of gravity and should give better balance and more safety in extreme speed turns.

Torsion bars are modified "X" design, placed below the center of the axle instead of above as in former Kurtis models.

Each car has an 80-gal fuel capacity in two tanks. There's a 46-gal tank in the tail and a 34-gal tank on the left side next to the driver. They're connected so that the weight of the fuel will not be concentrated in the tail, which also has a 12-gal oil tank. Tanks are sealed externally, with a combination rubber seal and Fiberglas. Brakes on the cars are Halibrand double spots, plus a vacuum booster assist to the master cylinder.

Thirty-one-year-old A. J. Watson, chief mechanic for John Zink's 1955 winner, has three Zink threats up his sleeve. In addition to last year's winner, and a Zink sprint car, Watson will turn up with a brand new roadster with appealing features.

A new steering system which includes an outside drag link on the right side aims to eliminate all the  
(Turn to page 136, please)





Using a six-ton hydraulic press to force a pivot tube into holes in the flanges of a channel shape suspended brake pedal. Later, tube is welded to the channel legs.

**P**EDAL levers for Buick cars are curved, channel section steel stampings. At one end, a short steel tube is pressed into holes that are pierced through the two legs of the channel. To insure that the tube will remain in correct position, specifications call for short arc welds, one to join the tube to each leg. Welding engineers of the Buick Motor Division, Flint, Mich., decided to try making the welds at a high rate in a setup using CO<sub>2</sub> gas to shield the arcs and so purchased a United Welders machine to do the job automatically.

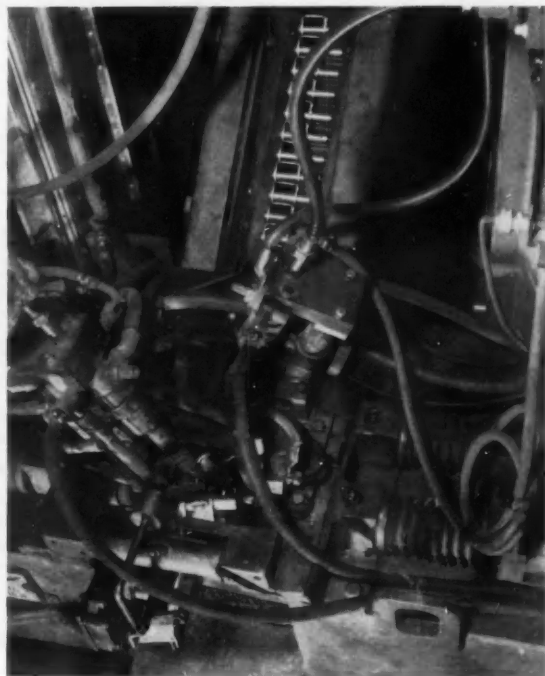
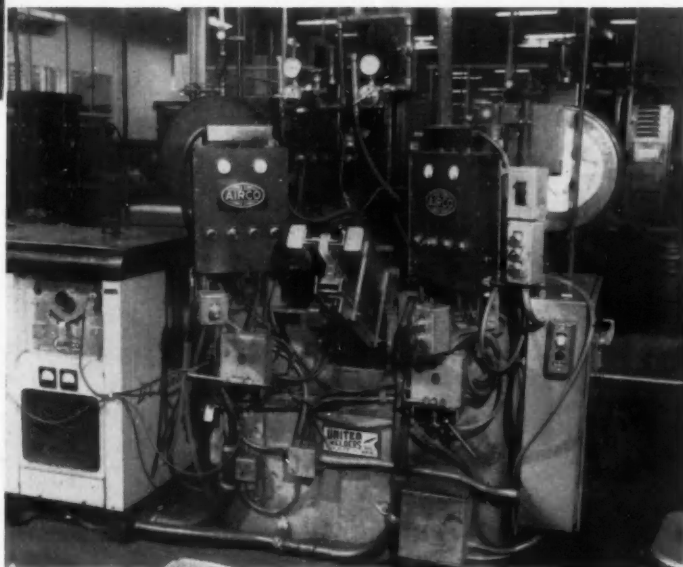
This machine is equipped with two Airco heads designed to use 3/64-in. electrode wire that is fed automatically from reels. Current is supplied by d-c Bumble Bee welders and CO<sub>2</sub> gas is fed from manifolded bottles through Airco controls. To attain the high output of weldments desired, the pedal stampings, with short tubes already pressed in place, are fed down a track-like magazine that is loaded by hand.

In loading, the pedals are placed so that the short tubes are guided by inclined channels at the lower end of which the two welding heads are located. Feeding by gravity is so arranged that each work piece pauses briefly and is air clamped below the electrode of each head in succession. These pauses are long enough to strike the arcs and to feed 3 1/2 in of wire that is fused in producing each weld.

(Turn to page 126, please)

## Arc Welds Shielded with CO<sub>2</sub> in *Pedal Production Setup*

Welding machine built by United Welders, Inc., to arc weld pivot tubes to Buick brake pedals which are hand loaded into the magazine center, and fed automatically to welding positions. Bottom picture—Closeup showing the two CO<sub>2</sub> gas shielded welding heads as they appear from the back of the machine. A short weld is made at each side of the channel to fasten the pivot tube to the channel legs.



**T**ESTIMONIALS offered by General Motors and Ford production engineers indicate that the industry is more than favorable to magnetic, contactless controls for machine tools, presses, and allied equipment. These statements, made during Westinghouse's 20th Annual Machine Tool Electrification Forum, in Buffalo last month, brought out the advantages of such control equipment in high production industries. After the large audience had been told

conventional controls, the machines had been running in production at a cycle time of 26 to 29 sec, but Cypak cut five seconds off of that time also.

For the conventional control panels used on the torus vane loader there is a period of 0.71 sec from the time the vane loader begins to feed one vane until the time it begins to feed the next. During this period there are four relay operations, three solenoid valve operations and three cylin-

Ford, in reporting the findings, stated that no trouble has been experienced with the new control equipment on the grinders even though they are in different plants and have been in operation for more than five months. Mr. Kowitz told the forum that Ford is always looking for ways of cutting down maintenance and that the company is very favorably impressed with the Cypak installations. Other applications at Ford are in the wind according to his statements. "Since there are no moving contacts in the logic system, it is obvious that the Cypak control is more suitable than relays for applications which are highly repetitive," stated Mr. Kowitz. Ford is looking forward to further development outside of the control panel to supplement Cypak. Along these lines, Ford developed a contactless limit switch which it calls a proximity switch. After this was disclosed, Westinghouse engineers told of a similar development which the company is about to market. By coincidence, it also calls its unit a proximity switch.

## Magnetic, Contactless Controls Among Topics at Westinghouse Forum

*By Thomas Mac New*

of the significance and acceptance of the control by the automotive makers, Westinghouse personnel revealed to the attending engineers a great improvement of the former development. New units—marketed under Cypak II—are of modular type encapsulated in polyester resin and designed as a plug-in, self-contained circuit.

### Setup at General Motors

The GM setup was described by S. F. Newman, senior project engineer, Process Development Section. For test purposes, GM put original Cypak controls on a torus vane loader. The machine was selected because performance of the equipment could be compared with that of other identical machines; rapid operation would permit a large number of cycles to be built up rapidly, and it was fairly simple on the small machine to combine Cypak and conventional controls for a quick transfer from one system to the other. Originally, the machine had a cycle time of 36 sec to load 36 vanes into a torus. With Cypak, the cycle time was cut five seconds. Using

der movements. In the conventional control panel there are altogether 12 control relays and two timers. The Cypak replacement for this conventional control consists of the power supply, one undervoltage control relay, 28 Cypak boards and four output amplifiers. Included in the 28 boards are a number of original OR units because of the use of standard limit switches and push buttons.

Mr. Newman commented, "Looking at static devices in general, one major question has to be answered: Do they have the potential for out performing relays?" His answer to the question was an unqualified "Yes."

### Cypak Units at Ford

Ford is using the Cypak units on two Springfield precision grinders and an OBI 75-ton Ferracute press. The grinders are used for finishing the hub of the converter impeller assembly for the automatic transmission. The Cypak installation on the grinders is more extensive and complicated than that on the Ferracute. R. W. Kowitz, staff electrical engineer of

### New Proximity Switch

The proximity switch developed by Westinghouse has no moving parts and is completely encapsulated. It makes use of the change in impedance that occurs when a normally saturated core becomes unsaturated. Normally, a magnet saturates the core; but when a small steel bar approaches, flux is shunted away from the coil assembly. The resulting change in impedance is sufficient to provide a change in signal capable of operating Cypak control elements. AUTOMOTIVE INDUSTRIES learned after the forum had ended that Westinghouse will market these switches in combination with a magnetic amplifier.

Westinghouse personnel gave the design, application, and economic considerations of the new Cypak II. In basic circuitry and logic, the new Mark II devices are similar to their prototype; but in other respects, there is no physical  
(Turn to page 166, please)

*Newest Creations of*  
**U.S. and Foreign Designers**  
*at*  
**INTERNATIONAL AUTOMOBILE  
SHOW**

*Latest addition to the Jaguar line is the new Two-Point-Four, five-passenger sports car. Built on a wheelbase of approximately 108 in., the car is powered by a six-cylinder engine develop 112 bhp at 5750 rpm.*

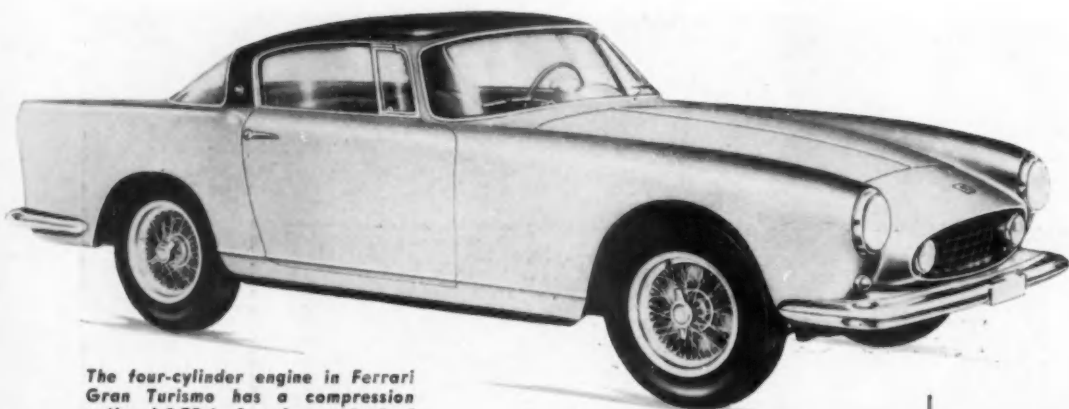


**B**ILLED as the first major trade fair to be presented in New York City's spacious Coliseum was the International

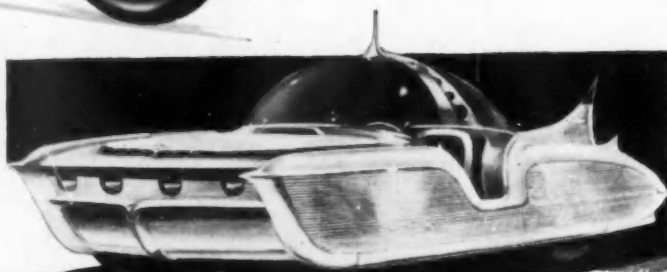
Automobile Show early this month. More than 150 cars of all types, plus an extensive array of accessories and supplies, oc-

cupied 88,000 sq ft of space in the new showcase's main exhibition hall.

Major manufacturers and dis-



The four-cylinder engine in Ferrari Gran Turismo has a compression ratio of 8.75 to 1 and an output of 180 bhp at 7000 rpm. Front suspension is independent, while rear is by coil springs and telescopic shock absorbers.



Two-passenger Astro-Gnome with aluminum bodywork, above, was conceived and custom-made by industrial designer Richard Arib. Styled to reflect space travel forms, the doorless car is built on a modified Nash Metropolitan chassis. Passengers gain access by raising the one-piece plastic door and lowering it when inside. United Press photo.



The four-door Citroën DS-19 sedan, left, is built on a 123-in. wheelbase chassis and has a four-cylinder engine with an output of 75 bhp at 4500 rpm. Special feature is a manually controlled level adjuster (see *AI*, April 15, p. 61).



Specially designed by Borgward to appeal to the American market because of its low operating cost is the Lloyd 600. The car is built on a wheelbase of approximately 79 in. and has a two-cylinder, four-stroke, aircooled engine with a continuous output of 19 bhp at 4500 rpm.

tributors of six leading automotive producing nations—England, France, Germany, Italy, Sweden, and the U. S.—presented their latest vehicle models. In addition to the familiar Aston Martin, Arnolt, Bristol, Austin, Bentley, British Fords, Hillman, MG, Morris, Riley, Sunbeam, Triumph, etc., England came up with a new Jaguar and Westminster Six.

France's latest developments in automotive engineering and styling were featured in the Dyna Panhard, Simca, Renault, and the new Citroën DS 19. Germany, whose offerings included





*Styled by Brooks Stevens, the custom-built Gaylord is powered by a Cadillac 300-hp V-8 engine with a displacement of 365 cu in. Four-speed automatic transmission has optional manual control.*

the Borgward, the BMW, the Mercedes-Benz, and the Porsche, also unveiled for the American market the new Lloyd 600.

The Italian school of advanced styling design was represented by the Alfa-Romeo, Ferrari, Lancia, and Maserati. Sweden presented to the prospective U. S. car buyer for the first time the new Saab 93 (see *AI*, Jan. 1, p. 98) and the Volvo PV 444.

In addition to Cadillac's Eldorado Brougham, Seville and Biarritz models, as well as Chevrolet's Corvette, U. S. automotive exhibits included: Chrysler 300, Windsor Spring Special, and the Imperial; Ford's Continental Mark II and Thunderbird; Lincoln Futura and Premiere; Packard's Caribbean and Predictor; and Studebaker's Golden Hawk and Pinehurst station wagon. Two custom-made American cars—the Gaylord and the Firebomb Dual Ghia—and special models by Richard Arbib and Don Bruce were also included in the U. S. display.

Motorcycles, scooters and specialized vehicle displays included engines by Auto-Cub, Lambretta, NSU, Norton and Vespa, BMW, and Messerschmidt. Another rather unusual aspect of the exposition was found in the elaborate displays by several leading oil companies and tire producers.

**Arnolt - Bristol Coupe Mark II** is based on the same design as the competition model with a six-cylinder, 130-hp engine. Principal differences in the new version are the increased luggage space, large rear window, and retractable head lamps.



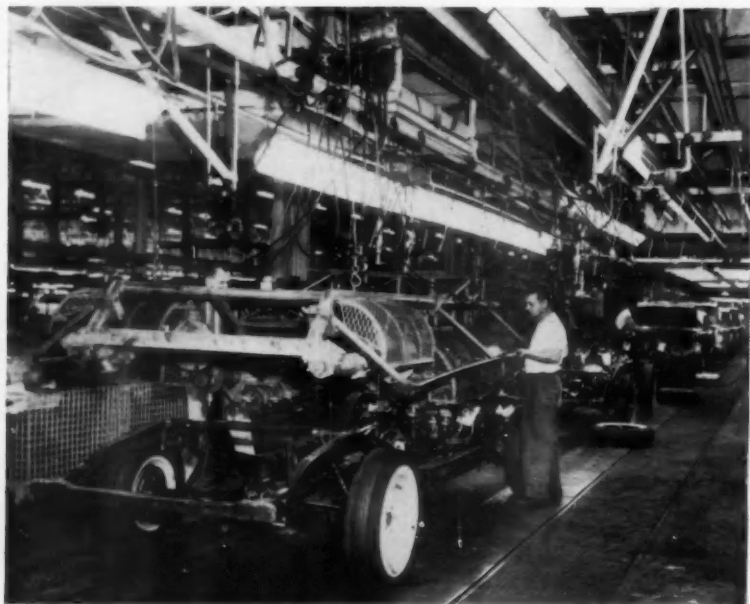
**Special reinforced bumpers, directional signals, and headlamps** are featured on the Volvo PV 444 for the U. S. market. Standard four-cylinder valve-in-head engine has a compression ratio of 7.3 to 1 and an output of 51 bhp at 4100 rpm, while the special sports engine has an output of 70 bhp at 5500 rpm.



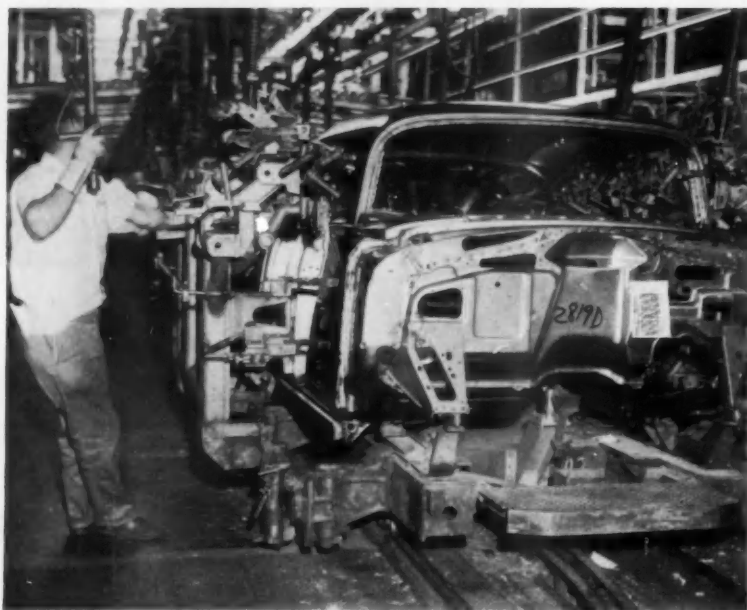
*Austin A90 Westminster Six is powered by a new six-cylinder, overhead-valve engine with an output of 85 bhp at 4000 rpm. Four-speed, synchromesh transmission and oversize Girling hydraulic brakes are other mechanical features.*



# Texas B-O-P Plant Equips 30 Per Cent



*This is the Octopus fixture used to determine the exact thickness of shims required for each body mounting point. It is used just ahead of the body drop.*



*View of body welding line showing the "gate" method of framing on the moving assembly line introduced in this plant two years ago. The gates come in on monorail conveyors from both sides of the line and are fastened securely to the massive dolly.*

**T**HE B-O-P assembly plant in Arlington, Texas, is the most modern of the General Motors assembly plants. Starting full scale production January 1954, it has 30 acres under roof and about 45,000 ft of conveyors of various types.

Arlington currently is equipping about 30 per cent of all cars with air conditioning, and probably produces more cars with this equipment than any other B-O-P plant.

Scheduling of the complex assembly operation is handled through an installation of Tel-Autograph equipment, consisting of four transmitters to handle each of four major centers, communicating with some 40 receiving stations.

One of the distinctive features of the operation is the employment of the so-called "Gate" welding assembly on the body line. Side panels are assembled in the gate fixtures and welded while approaching the body framing line. The gate fixtures approach the body assembly line from both sides and are clamped securely about the underbody riding on the dolly. No fixed framing fixtures are employed here. When the sub-assembly is ready for installation of the roof panel, the panel is lowered into place and clamped into the side gates which then constitute the framing fixture. All of this is done with the sub-assemblies in motion on the assembly conveyor.

Chassis assembly is handled on a monorail conveyor as a suspended assembly line until the finished car is ready to roll on its own wheels.

Another interesting feature is the use of the "octopus" fixture, shown here. It is actually an inspection fixture lowered onto the chassis just before the body drop.

# of Cars with Air Conditioning

Its function is to gage the alignment of body brackets, permitting operators to determine the amount of body shims required at each point. Moreover, the proper thickness of shims is applied immediately at each body bracket and held in place temporarily by means of adhesive tape. This assures perfect body alignment without danger of

distortion due to improper shimming.

Front end sheet metal assembly originally was handled on the usual type of merry-go-round fixture. More recently, however, the operation was modified. Initial assembly now is done in four fixtures on the merry-go-round, then the assembly is transferred to a short section of

straight line assembly for completing the job. It is said that this procedure has resulted in speeding assembly materially.

It goes without saying that sheet metal and body painting is a major part of the work in this plant. Although production volume does not approach that of any of the divisions, things are made complicated by the fact that each color stage must take into account all of the paint options offered by each of the three divisions. A total of some 51 colors implies unusual complexity of scheduling on the lines and in the paint mixing room.

The body paint shop area contains a large installation of Ross Air Systems drying ovens and air conditioning equipment. Most of the spray booths were supplied by Binks.

## Molybdenum Coating Extends Life of Sizing Punch

**I**N a recent issue of **AUTOMOTIVE INDUSTRIES** (February 15, page 63) we described the transfer press production at Buick's new rear axle department of flanges for the ends of the axle housing. Produced in a Verson transfer press, the flange is made in five stages, starting with the circular blank.

As production developed it was found that the sizing punch on the fourth station was taking tremendous punishment and had to be replaced in a matter of 200-300 pieces. Buick's metallurgical department took over at this point to develop some different type of material or heat treatment or surface finish to increase the number of pieces before replacing the punch.

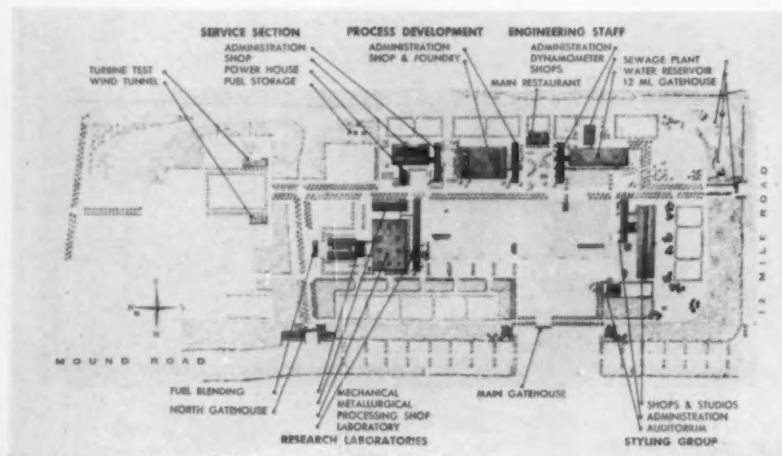
It was found that the trouble was concerned with loading or welding of metal on the punch. Various expedients were tried including chromium plating as well as the use of special die materials. None of the methods had much effect upon extending punch life.

Finally the specialists turned to molybdenum. They found that a thin coating of pure molybdenum deposited by means of a

metallizing gun provided a complete and exceptionally good solution. Reports to date indicate that punches coated with pure moly have given a life of 40,000 to 50,000 pieces.



Pure moly being applied to the punch by means of a Metco metallizing gun while the punch is spun on the lathe.



Plan view of the new General Motors Technical Center

## For a **BETTER FUTURE SOONER**



GM research workers use dynamometer test cell to evaluate automatic transmission gears at GM Technical Center. On dynamometer in the foreground is a Powerglide unit.

Equipped for virtually all types of experimental melts, this foundry is operated by Metallurgical Engineering Dept. of General Motors research staff at GM Technical Center. Like other special purpose areas at Technical Center, it features maximum flexibility.

**F**EATURED on these two pages are the general layout and some of the outstanding research and test equipment at the new General Motors Technical Center. Scheduled to be dedicated May 15-16, the Center occupies the central 320 acres of a General Motors 813-acre tract a short distance northeast of Detroit. There are 17 major buildings and several small utility buildings. Employment is expected to be around the 4000 mark.

The Center consists of four major groups—Engineering Staff, Research Laboratories, Process Development, and Styling. A fifth group—Service Section—operates and maintains the facilities and services.

An assembly machine is shown under construction in General Motors process development section at GM Technical Center. It is typical of many semi-automatic assembly machines produced by process development section for various GM divisions.





Mechanics in vehicle development group, General Motors engineering staff, check weight distribution of a six-cylinder Opel Kapitän engine. In background is Opel sedan, produced by GM's German subsidiary, Adam Opel, A. G. Vehicle development group built the prototype of the Opel.

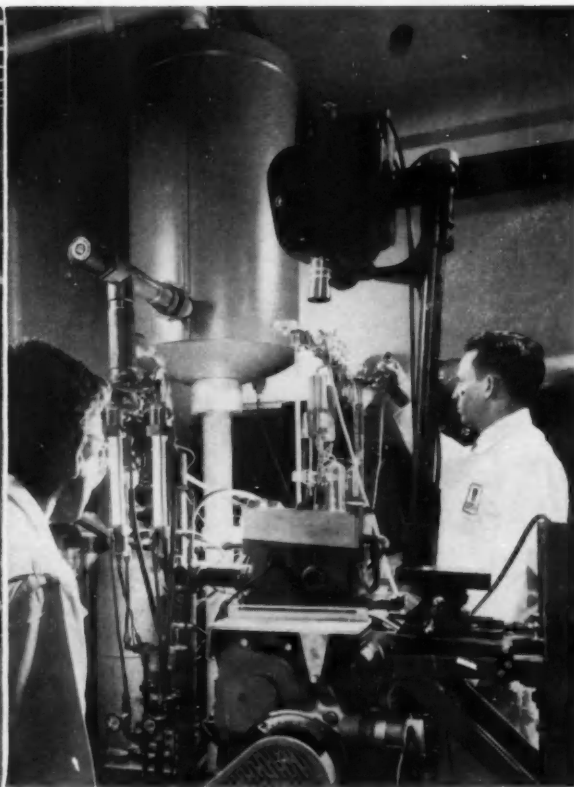


Limited production of burners for the Allison J-71 turbojet engine is handled by parts fabrication group of General Motors engineering staff at GM Technical Center. Occasionally such limited production assignments are farmed out to Technical Center shops.



This complete automotive engine balancing machine was developed by General Motors research staff for use in production of Chevrolet engines.

Above, right—High-speed photography is an important tool in studying the automotive engine's combustion process. GM



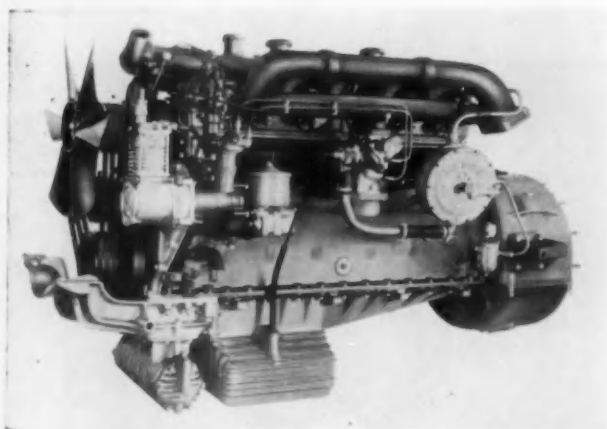
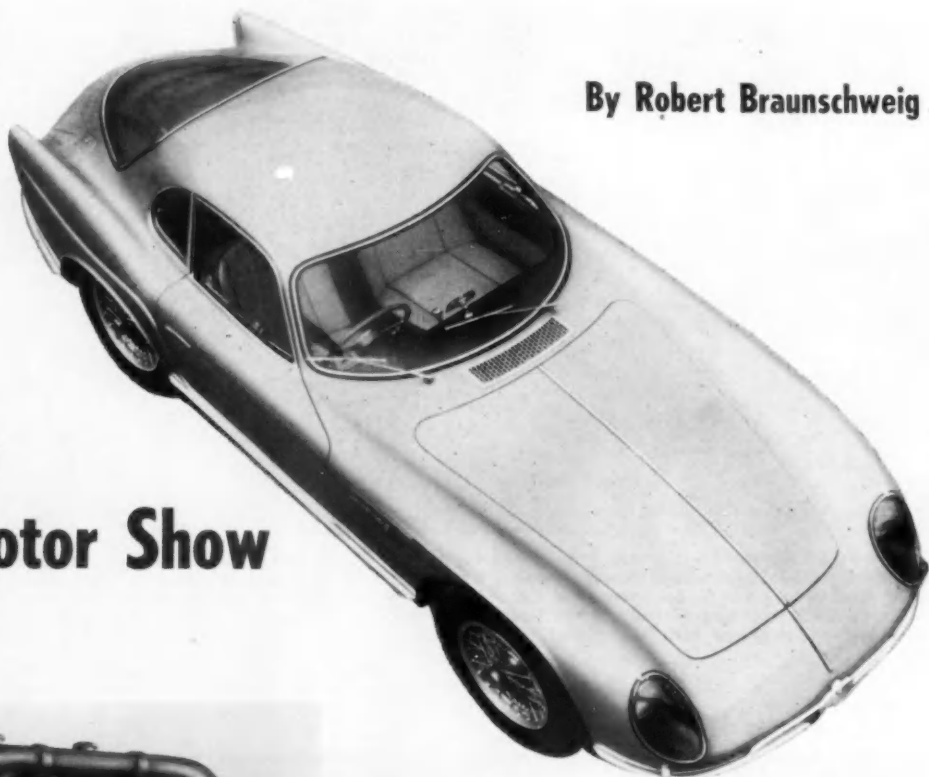
engineers are shown preparing to run a test in which the combustion can be photographed. The special equipment which is used is capable of speeds up to 1000 frames per second in taking pictures through the window in the top of a single cylinder test engine.



Alfa Romeo Sportiva  
model with 133-hp  
engine

By Robert Braunschweig

## The 38th Turin Motor Show



Fiat engine equipped for use of LPG. It has a piston displacement of 614.7 cu in. and develops 197 hp

**A**N entirely new Lancia model, numerous novelties by Fiat and Alfa Romeo and several outstanding new body designs were the highlights of the 38th International Turin Motor Show which was held from April 21 to May 2.

The new "Flaminia" displayed by Lancia replaces the well-known Aurelia model and has several new characteristics, although the V-6 engine and the rear De Dion suspension system have been retained. With an engine of 150 cu in. displacement and an estimated weight of 3000 lb the Flaminia is at present the only deluxe sedan with prestige value produced in Italy. According to local custom the new model was exhibited

TURIN, ITALY

long before actual deliveries, which are scheduled for the autumn of this year at the earliest.

The V-6 engine has been designed for higher torque at medium speed. With a bore of 3.15 in. and a stroke of 3.20 in. it is nearly square. The compression ratio is 8 to 1; output figures given are 97 hp at 4800 rpm; and maximum torque 137 lb ft at 3000 rpm. With relatively modest basic dimensions (wheelbase is 113 in., front tread 54.7 in., rear tread 53.9 in.) a full six-passenger sedan body is offered.

It came as a surprise that the old-type Lancia system of independent front wheel suspension by vertical sliding pillars, long and narrow coil springs and limited wheel movement has been discarded after about 34 years. It has been replaced by the conventional design with large, soft coil springs. The rear suspension still is of the De Dion type with long leaf springs, a large, curved axle tube connecting the two rear wheels, and a lateral stabilizing bar anchored in trunnions at the axle tube and the frame.

Unit construction of the single plate clutch, the four speed transmission and the axle drive is retained. Inboard rear brakes are used in order to reduce unsprung weight. The transmission has been modified and incorporates a direct drive fourth speed ratio.

The new sedan body designed by Pinin Farina and derived from his Florida prototype hard top sedan may have a considerable influence on Continental bodywork trends. Instead of the former unit body and frame construction, a built up chassis is now used. Engine and suspension units are carried on an



auxiliary frame which can be easily separated from the main chassis frame.

The well-known "America" body on the Gran Turismo chassis is now replaced by a convertible two-passenger coupe by Pinin Farina. The improvements introduced at the recent Geneva Show for the Gran Turismo hardtop coupe are incorporated in the new body as well. The smaller Appia 2nd series is now available as a chassis with an optional 52 hp engine and was shown at Turin with special coachwork by various makers.

Thanks to the increased output of the Italian oil industry the amount of liquefied gas fuel available has now reached sufficient proportions to induce Fiat to design a commercial vehicle engine to run on this fuel. This six cylinder engine of 614.7 cu in. displacement has a bore of 4.92 in. and stroke of 5.71 in. With a compression ratio of 8 to 1, estimated output is 197 hp at 2200 rpm. The auxiliary fuel vaporization and pressure regulator units follow the well known American pattern. Liquefied gas is stored at approximately 170 psi, and this is reduced to 4 to 10 psi in the pressure regulator. In a vaporizer temperature exchange unit this is finally brought down to a slight vacuum and the gas is then mixed with intake air in the special carburetor. Since the fuel price will be largely determined by political factors, the commercial success of this venture cannot now be judged.

The passenger car range of Fiat incorporates a few additions and several changes of well-known models. The 600 Multipla multi-purpose vehicle is now available as a five-passenger taxicab.

Both the 1.4 litre and the 1.9 litre versions of the medium sized Fiat model have come in for a number of improvements and are now called 1400 B and 1900 B respectively. Increased compression ratios (from 7 to 1 to 7.5 to 1) and improved breathing arrangements have increased the power output from 49 to 57 hp in the smaller and from 69 to 79 hp in the larger engine. These power units now require premium fuel, but this is available in Italy with an octane rating of up to 100 research.

Although the small Giulietta four door sedan shown a year ago will not be in regular production for some months, the Alfa Romeo firm has introduced two new sports car versions of its present 1300 and 1900 high-performance four cylinder models. These are the 2000 Sportiva and the Veloce version of the Giulietta Sprint. While the former uses the same basic twin ohc 133 cu



**Lancia Flaminia sedan with body designed by Pinin Farina**



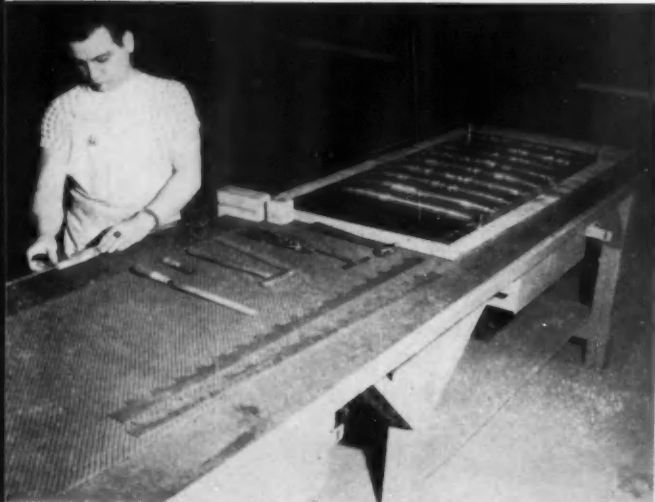
**Alfa Romeo Giulietta Sprint Veloce model which is powered by a 78.7 cu in. engine developing 89 hp**

in. power unit and the fully synchronized five-speed transmission of the well-known 1900 Super Sprint, it must be considered as an entirely new model otherwise. With a power output of 133 hp at 6000 rpm delivered by the engine with two twin carburetors, the closed two seater coupe has a comparatively comfortable body and will be suited for very fast touring and long distance sports events. The rear suspension is particularly interesting, consisting of a De Dion axle with converging rods anchored far forward in the floor and taking up acceleration and brake thrust; lateral stability is conferred by a Watt linkage with the vertical part fixed at the axle tube.

Very interesting new body designs were shown by Pinin Farina, Ghia and Abarth. Farina's Super Flow sports coupe on the experimental 3500 Disco Volante Alfa Romeo displays a very low main body with a plastic upper structure giving an uninterrupted visibility all round. The side flaps open in Mercedes 300 SL fashion, but they are supplemented by the more normal side doors.

Rear stabilizing fins of exceptional size are one of the features of the Chrysler Dart, a Ghia prototype body of unusual interest. This is a very long and low four passenger coupe, the roof and side pillars of which will be made retractable in a forthcoming version.

Particularly attractive roof lines are to be found on the coupe bodies by Boano, whose Chrysler Corsair II displays unusual front treatment lines. Carrozzeria Touring had a very clean roadster body on the Aston Martin DB 2-4 chassis.



On prefit tables, reference templates of assemblies receive parts, coordinated to template with tooling holes and pins. Manual filing is done when necessary.

**By Paul E. Foersch**

Metal Bonding Supervisor

Twin Coach Aircraft Division

**W**ITH aircraft speeds constantly on the increase, the comparatively new process of metal adhesive bonding becomes more vital in aircraft production. This process improves fatigue characteristics (no drilling required) and permits use of thinner materials than can be riveted, saving weight. In addition, adhesives insulate between dissimilar metals; and bonding gives smoother surfaces, impor-

## Special Techniques for Metal Adhesive Bonding at Twin Coach Aircraft Division

tant aerodynamically, and permits large area joining.

At Twin Coach Aircraft Division, Buffalo, N. Y., special facilities occupying over 25,000 sq ft of floor space were installed during 1955 for the preparation and bonding of aluminum to aluminum, aluminum to magnesium, and magnesium to magnesium.

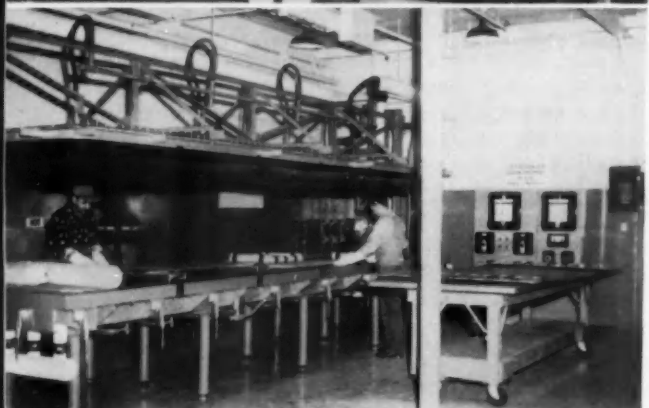
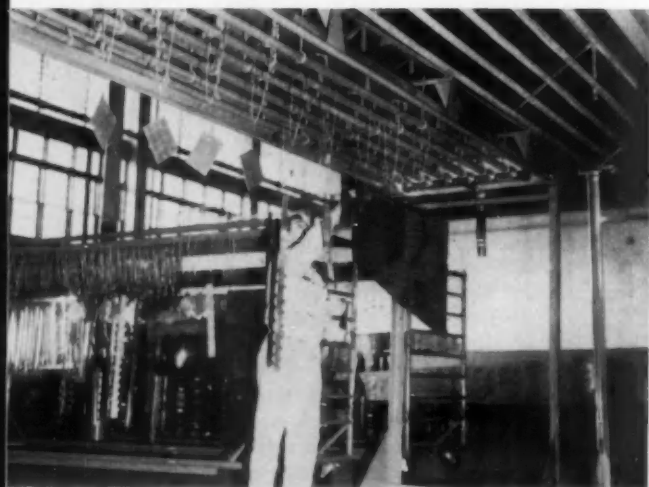
Quality control is of utmost importance because the success of a metal bonded assembly cannot be properly determined by other than destructive methods. Controls at Twin Coach include frequent chemical analysis of solutions used to treat metals prior to bonding; exhaustive testing of adhesives as received and during plant storage; precision controlling of curing processes, including pressures, processing temperatures and time intervals. Also, liberal use is made of test specimens processed as well as of production parts.

Quality control also includes strict attention to cleanliness in the entire bonding department, particularly in parts handling; and to keeping flow times between various stages of bonding at an absolute minimum. Tools used in the bonding are periodically requalified by destroying a test assembly, identical to a production assembly, and examining the bond. These are only some of the factors under constant surveillance.

*(Turn to page 128, please)*

**Above, left, parts are hung on special carrier for travel through treatment tanks. Piping shown under carrier is used for special rinsing.**

**Immediate left, the big vacuum platen press is readied; control board is over to right, rear. Pressure plates or overlays are put on top of assemblies, now ready for bonding heat.**



AUTOMOTIVE INDUSTRIES, May 15, 1956

# Improved Piston Pin Quality

## Through Statistical Control

By Ray J. Stanish, Chief Engineer

and

George S. Holzheimer, Quality Control Manager

Replacement Div.,  
Thompson Products, Inc.

THE problem of obtaining ultra close tolerances in the production of automotive piston pins is almost as old as the industry itself. The size, roundness, taper, and surface finish of the outside diameter of piston pins were rigidly specified long before such close tolerances were even thought of in connection with many other components of automotive engines. In order to meet these rigid requirements, the pin must be scheduled for repeated passes on centerless grinders; the gradual stock removal is then followed by lapping operations.

Piston pins are segregated into various classes, according to the tolerances of their outside diameters. The number of classes varies with different manufacturers; for example, some manufacturers segregate piston pins having diameters within 0.0002 in. of one another in the same class; others adhere to closer control and allow a total variation of 0.0001 in. within each class.

Here, at Thompson Products, quality standards specify that pins produced at high production rates be segregated into five classes: A, B, C, D, and E. All the pins in a given class have diameters within 0.0001 in. of one another, with a total spread of 0.0005 in. between the five classes.

Figure 1 shows the distribution of production among the five classes during the period when total production was sized and segregated. It is evident that the operators knew that inspection would separate their production into classes of 0.0001 in., and they therefore relaxed their efforts to take full advantage of the 0.0005 in. spread between class A and E.

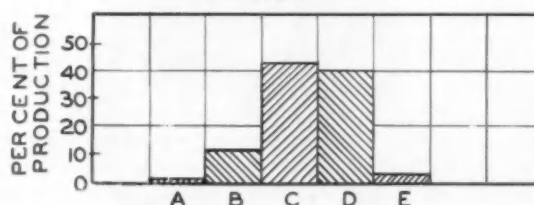
The product resulting from such a procedure was acceptable in quality but the process itself was uneconomical. Electronic gaging devices partially solved the problem of size segregation, and for extended usage gave very satisfactory results compared to hand gaging methods. But there still remained the problem of improving manufacturing and inspection procedures so as to reduce production to less than five classes.

Statistical quality control provided the correct answer. Although patrol inspection and X and R charts had been used to control piston pin quality during processing, it was felt that something more was needed. The "something more" turned out to be accurate and practical in-process control through the use of sampling inspection techniques.

In order to maintain control during the entire finishing process it was necessary to get the co-operation of each operator. The manufacturing foreman was encouraged to impress upon his workers that the grinding and lapping of piston pins require highly trained and skilled operators whose first obligation must be to quality. With their whole-hearted acceptance for

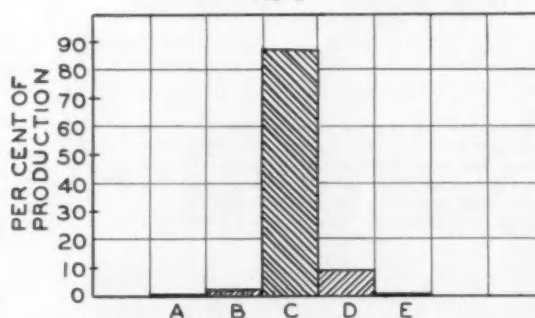
(Turn to page 176, please)

FIG 1



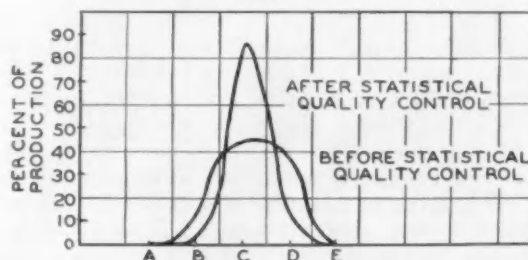
Distribution of outside diameter classes before statistical quality control

FIG 2



Distribution of outside diameter classes after statistical quality control

FIG 3



Production distribution before and after statistical quality control

# Power Steering Pump Design

## *Keeps Pace with*

## Industry Advances

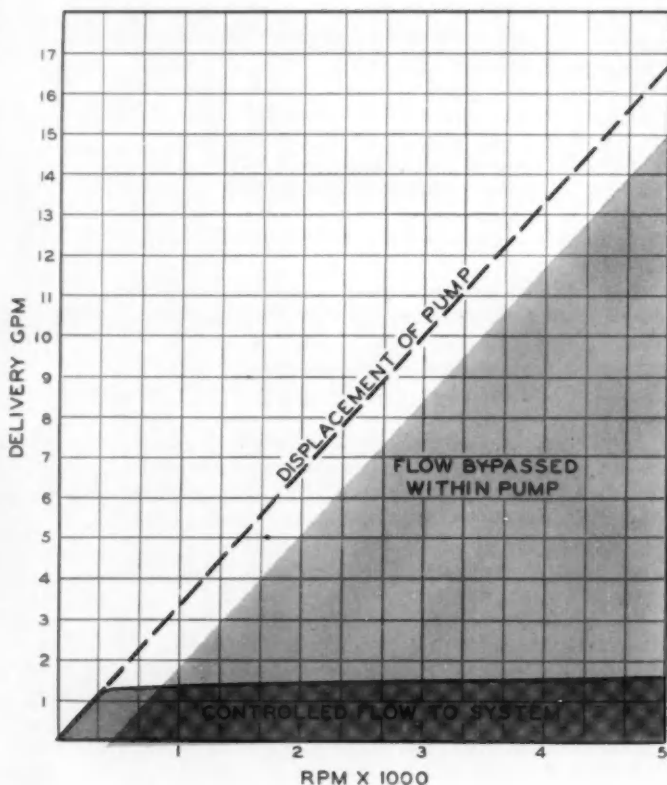


FIG. 1 ▲

One of the earliest power steering pumps developed for passenger car application. This vane type unit was built in 1927 by Harry F. Vickers, founder of Vickers Inc. A system using this pump required addition of a separate reservoir, relief valve and flow control valve.

FIG. 2 ►

Chart showing typical power steering pump delivery curves. The dotted line represents pump flow over the operating range of input speeds when flow is not controlled. The solid line indicates controlled output. The pump is selected to meet maximum delivery requirements.



By Ray C. Conner, Vickers, Inc.

ONCE a new concept has been accepted by the car-buying public, automobile manufacturers are quick to make design changes to better their position and keep pace with the new demand. The influence which public acceptance has had on power steering and steering gear is a good example.

Often overlooked, however, is the fact that the design of the hydraulic components which make up the power steering system must also be altered and improved to keep pace with other automotive design changes. The most critically affected of these components is the heart of the power steering system—the oil-hydraulic pump.

Twenty-five years elapsed from the time the first pump for power steering of automobiles was developed until the concept was finally accepted in 1951. At that time, the horsepower race was gathering momentum. Changes in engine operating characteristics, new steering gear designs and chassis improvements forced power steering pump manufacturers to work fast to keep up with ever-changing requirements.

### The Effect of Engine Changes

Two major considerations in the design of a pump for a given power steering application are: (1) engine top speed and (2) engine idle speed.



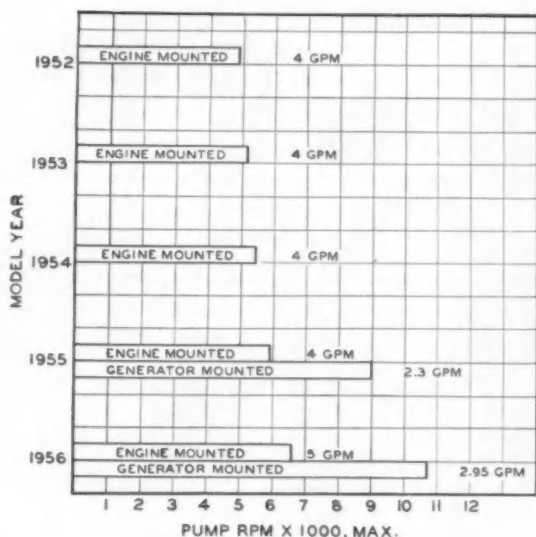


FIG. 3

Bar chart showing how upper limit of pump operating speed has increased since 1952.

Greatest resistance to turning of the vehicle's front wheels is normally encountered when the vehicle is standing still and the engine idling. Also, the need for fast, positive steering action may often be most needed during periods of low engine rpm as is the case during deceleration or coast-down. Thus the pump must be capable of delivering at engine idle speed the maximum specified oil flow required for acceptable actuation of the steering linkage. In the case of a belt-driven pump, minimum input speed may be 20 to 30 per cent above engine idle speed; for generator-mounted pumps, input speed may be 100 to 125 per cent greater than engine idle speed.

Determination of the required pump capacity in gallons per minute is based on an assumed average steering wheel turning rate of one revolution per second with a given power steering booster design (piston size) and overall gear ratio. The pump is then designed to have a delivery curve (see Fig. 2) which will produce necessary flow (gpm) at input speed.

In 1952, top speeds were about 4000 rpm and idle speeds ranged around 400 rpm. Idle speeds have not changed significantly since 1952, but top speeds and delivery requirements have. The bar chart in Fig. 3 shows how the increase in upper level of engine speed has affected the top speed at which one type of belt-driven power steering pump is rotated. Also included in the chart are data on top speed for two recent generator-mounted designs. Figure 3 indicates that in 1952 top speed for this engine-mounted pump was just under 5000 rpm; in 1956, top speed has jumped to approximately 6500 rpm, even though idle speed remains about the same.

Higher operating speeds create a potential noise

problem in the power steering pump. High rotary speeds mean high deliveries and the obvious need for correspondingly high pump inlet flow rates. Careful design of ports, passages and working components in belt-driven pumps of the type shown in Fig. 4 produces maximum inlet flow characteristics, but the best of designs without some type of supercharging generally have 5500 rpm as their approximate upper limit. Beyond this speed, a supercharged system is required.

Top speed is even more of a problem with generator-mounted pumps. These pumps are coupled directly to the generator shaft and therefore run at about twice the speed of belt-driven types. With a top speed in excess of 10,500 rpm, hydraulic supercharging becomes mandatory to insure quiet operation. Pumps designed for supercharging by the jet pump principle create negligible additional load on the engine.

Since maximum delivery to the system is required from a power steering pump at its minimum operating speed, the additional pump delivery rate, created at the higher engine speeds (shown by the dotted line in Fig. 2) represents surplus flow. If this excess flow were allowed to pass through the system, several undesirable conditions could result: (1) excessive noise, (2) excessive back pressure, (3) excessive heat, and (4) premature wear and leakage in system components. To preclude this possibility, a flow control is included which by-passes excess flow directly back to the pump inlet, maintaining the most desirable constant flow rate to the system (indicated by the solid line in Fig. 2) throughout the pump's operating speed range.

### The Effect of Steering Gear and Chassis Changes

In an effort to minimize possible consumer resistance to the concept of power steering, automobile manufacturers at first designed their systems to re-

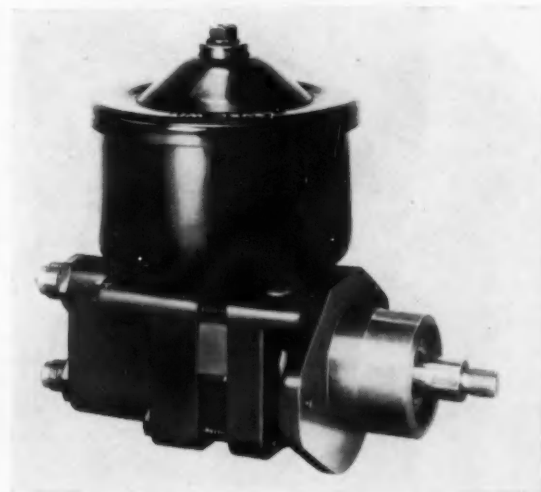


FIG. 4

Typical belt-driven power steering pump design. This pump has a separate reservoir (mounted on top as shown) and integral relief and flow control valves.

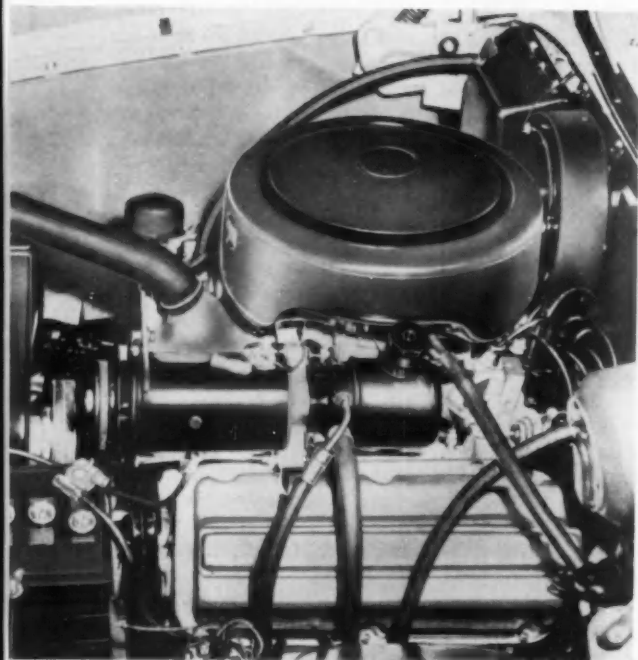


FIG. 5

One of the latest of generator-mounted power steering pump types. This unit has integral relief and flow control valves and has the pumping elements enclosed within the reservoir to minimize size and weight. Because of maximum input speeds in excess of 10,500 rpm, this pump must be supercharged.



FIG. 6

New belt-type pump which possesses optimum delivery characteristics, operates at a minimum sound level, and occupies approximately 40 per cent less than conventional types having a comparable rated capacity.

tain a similarity to conventional gears by using the same steering ratio (about 26 to 1 in 1952). Pump delivery requirements were determined by the volume of oil displaced in the system in a given unit of time, based on the previously mentioned average steering wheel turning rate of one revolution per second.

As design philosophy changed, steering ratios decreased. Some current systems are using ratios around 21 to 1, thus upping system delivery requirements by more than 19 per cent as compared with 1952 designs. This factor has aggravated the problem of high top operating speeds and critical pump inlet conditions which breed potential noise, back pressure and heat.

Chassis changes resulting in heavier vehicles have been the trend since 1952. The added weight, particularly in the front end, in combination with increases in tire size, has resulted in a greater tire pad or contact area which demands higher system working pressures for actuation of the power steering linkage.

Higher pressures of themselves do not create a need for increased oil delivery from the pump; they do, however, result in greater potential leakage within the system. Any increase in potential oil leakage imposes a further demand on the pump and raises the delivery requirement. Initial system pressures (in 1952) were established at 750 psi; today's operating pressures in some passenger cars have reached 1050 psi.

## Recent Developments

Increased demands of the automobile industry have been met by improvements in the internal construction details of existing pumps and by development of new units. At the same time, substantial reductions in the cost of the unit have been effected.

Demands in the form of greater delivery requirements have been made more complex by the desire that the pumps meet these requirements with no increase in weight or size. Among the new units which meet the latest objectives is the generator-mounted pump illustrated in Fig. 5. Delivery requirements are met while size and weight are held to a minimum by the unique expedient of designing the pumping elements to be enclosed within the reservoir. This design is approximately 50 per cent smaller than would be the case were it of conventional construction with the pump and reservoir assembled as separate units.

Another new power steering pump designed to meet the latest requirements for automobile manufacturers who prefer the belt-driven type is shown in Fig. 6. This pump possesses optimum delivery characteristics, operates at a minimum sound level, and occupies approximately 40 per cent less space than present types having a comparable rated capacity.

Additional new units, now on the drawing boards or in the prototype stage of development will make their appearance as the demand for their particular abilities and characteristics is made known. In supplying accessory equipment for the automotive industry, the best way to keep up is to stay ahead. Whatever the next trend in engine, steering gear or chassis design may be, new power steering pump units will be ready to meet the new demands.



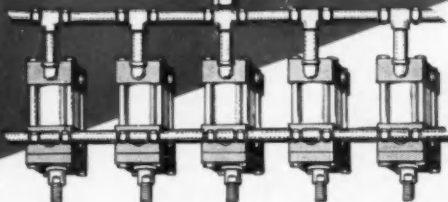
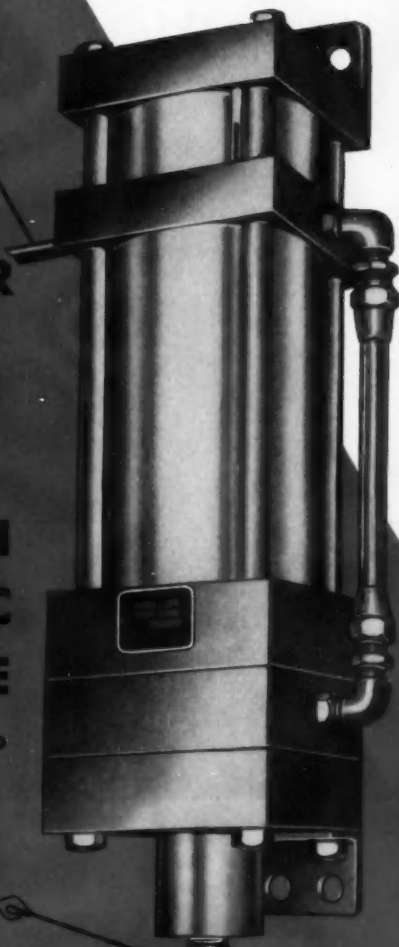
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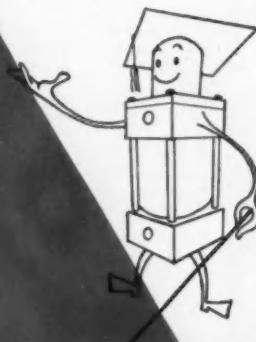
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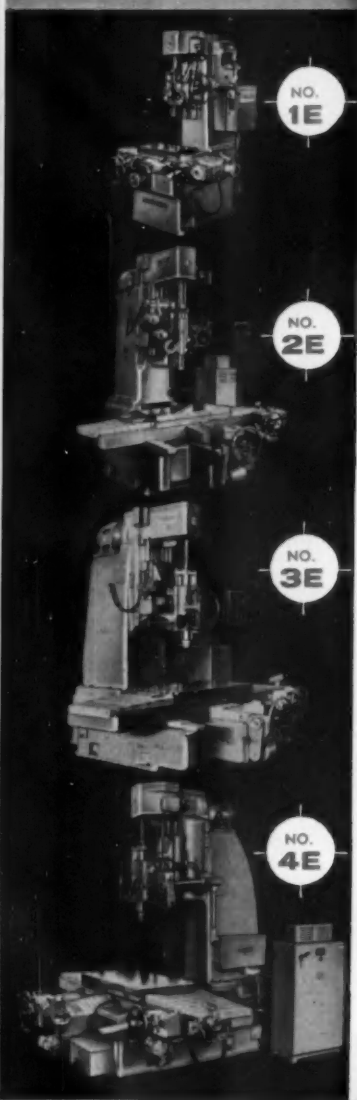


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After initial assembly in chain, bushings are straight.



Bow in bushings acts to keep a snug joint on non-load side.

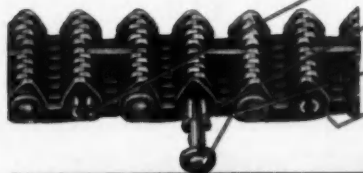
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Built-in check in joint — originated by Link-Belt — allows forward articulation for engagement with sprockets, but prevents back-bend and whip.

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- Removable segmental liners or bushings extend across entire chain width — double bearing surface, halve pressure on pin.
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- Broached holes in links form lock grip for bushings.
- Smooth, case hardened pin is free to rotate between segmental bushings, presents every part of its surface for wear.

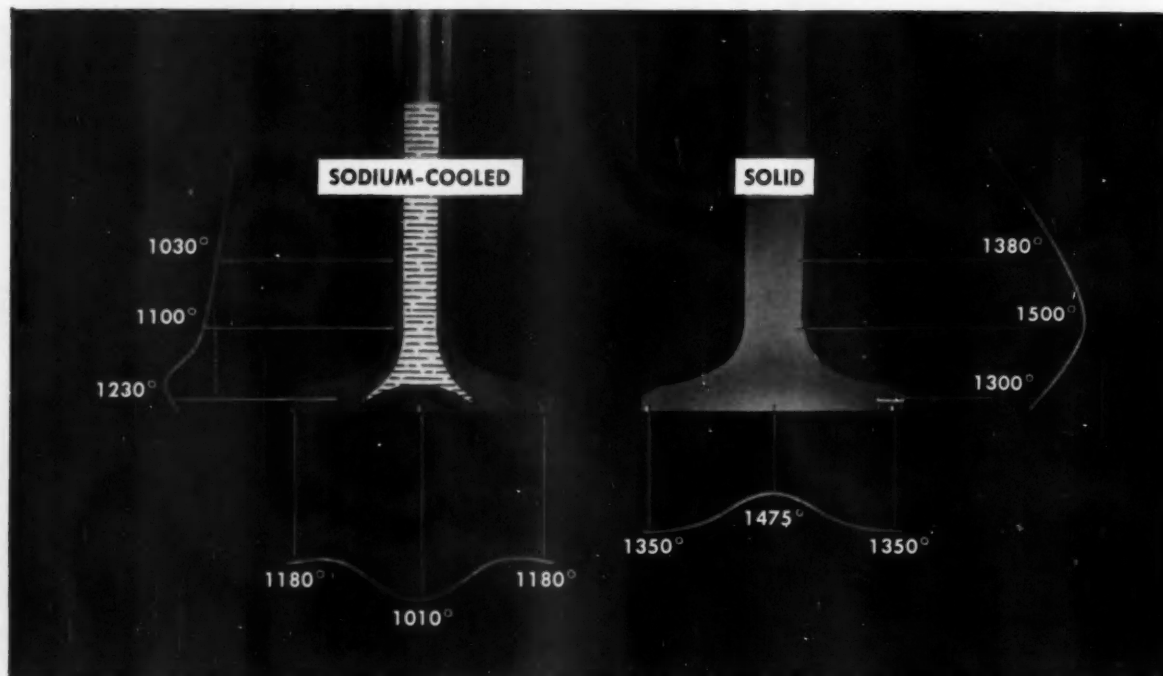


# LINK-BELT

TIMING CHAINS AND SPROCKETS

LINK-BELT COMPANY, 220 South Belmont Ave., Indianapolis 6, Ind.

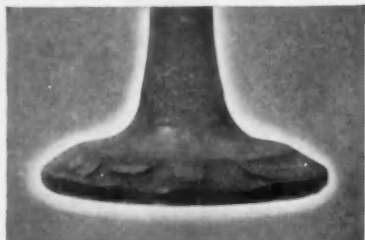
# Eaton Sodium-Cooled Valves Run Cooler—



These curves show operating temperatures of Sodium-Cooled and Solid Valves under similar conditions of high output.



Eaton Sodium-Cooled Valve after 110,000 miles—still in good condition.



Conventional valve after 35,000 miles in same type of operation as Sodium-Cooled Valve shown above.

## Cooler Valves Last Longer

Today's trend in engine design toward higher speeds and more economical fuel-air ratios results in higher temperatures for many operating parts—including exhaust valves. These higher temperatures sharply reduce valve resistance to corrosion and distortion, definitely limiting valve life. Eaton Sodium-Cooled Valves, operating at considerably lower temperatures, maintain corrosion resistance and strength.

In general, maintenance of Eaton Sodium-Cooled Valves in heavy-duty truck engines is scheduled only at time of major engine overhaul. No in-between trips to the shop are necessary for valve servicing. Engine output is maintained at high levels over long mileages. In many millions of miles of heavy-duty operation, Eaton Sodium-Cooled Valves have proven their ability to keep trucks on the road and out of the shop.

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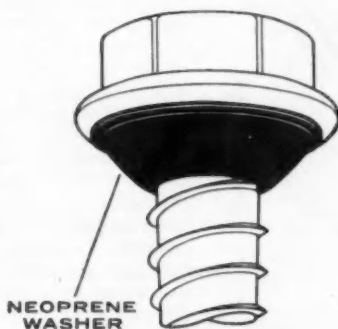
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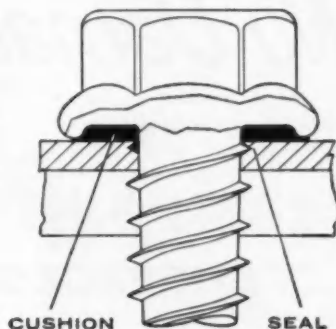
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NEOPRENE WASHER

... confines and controls flow of conical neoprene washer



CUSHION

SEAL

... so washer seals the hole and cushions the fastener head!

## Now you can • prevent leaks at fastener holes

- protect fine finishes from fastener damage
- stop vibration noises and squeaks

It's the combination of undercut head design and tough, conically shaped neoprene washer that makes Tuff-Tite fasteners work. The undercut helps confine and control spread of the neoprene washer as it is compressed. The washer's conical shape causes it to flow into top threads and seal the fastener hole.

Tuff-Tite fasteners won't mar fine finishes and they stop vibration noises and squeaks because the neoprene washer spreads itself completely between fastener head and surface. The washer actually cushions the fastener and prevents metal-to-metal contact.

*Leakproof, non-marring, shock and squeak absorbing!*  
If you need these fastening advantages, you need National Tuff-Tite fasteners. Write for the Tuff-Tite fastener folder describing this line in detail.



## THE NATIONAL SCREW & MFG. COMPANY CLEVELAND 4, OHIO

Pacific Coast: National Screw & Mfg. Co. of Cal.  
3423 South Garfield Ave., Los Angeles 22, Cal.

### Tuff-Tite fastener facts

Standard National Tuff-Tite fasteners are available in hexagonal, pan, round and truss head styles for screw diameters No. 6 to  $\frac{3}{8}$ " inclusive ... maximum over-all length  $1\frac{1}{2}$ ". Standard fastener types are wood screws, self-tapping screws, thread cutting screws, machine screws and stove bolts. Tuff-Tite fasteners are pre-assembled with neoprene washers.

Washers are molded of neoprene which has a durometer hardness of 85 to 95.

Write for information on *special* Tuff-Tite fasteners.



Fasteners



Hodell Chains



Chester Hoists



**THROUGH 6  
STAGE DRAW...**

*No Damage*

**TO**

**PRE-PAINTED**

**SURFACES!**

**Hunter Douglas Pre-Painted Aluminum  
Strip Forms Readily, Eliminates  
Painting and Finishing Costs!**

**Now available in a complete color range!**

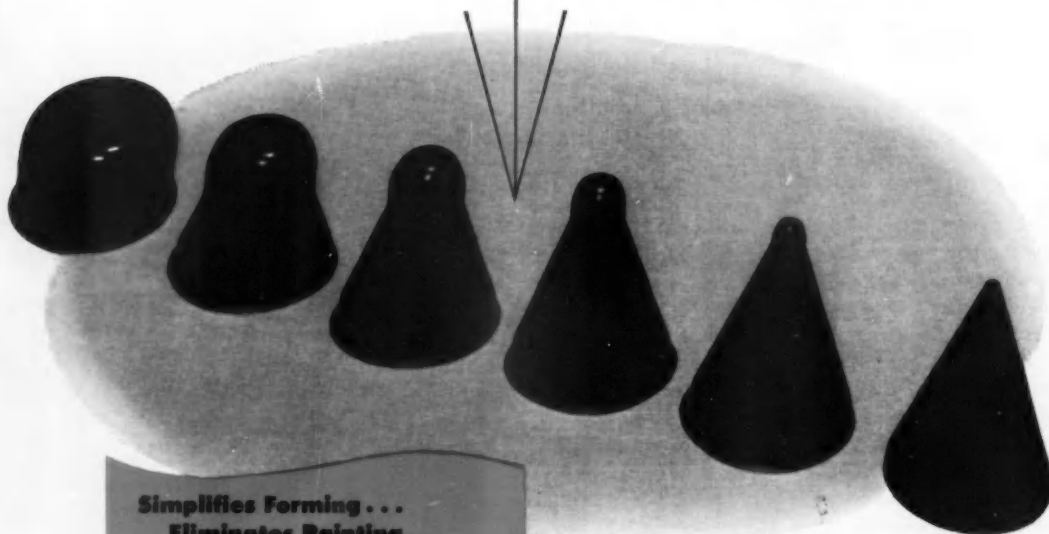
Here's visual testimony to the unusual elasticity of the painted surface on Hunter Douglas Pre-Painted Aluminum Strip! The cone illustrated was deep-drawn through six successive stages on a transfer press. Even though these dies were not specifically made for forming aluminum, and were experimentally applied, the deep draw was highly successful. Not a single blemish occurs on the pre-painted .035" 61S type aluminum stock!

This new Hunter Douglas achievement provides the metal forming industry with a better pre-painted strip which can be readily *roll formed, embossed, stamped or deep-drawn* without damage to the surface!

**TWO COAT ENAMEL FINISH** gives a hard, lustrous surface. Can be secured in a wide range of colors to harmonize or contrast with other decor. The double coating, with each coat individually baked, possesses remarkable adhesion and scratch resistance.

**EXTERIOR DURABILITY COMPARABLE TO AUTOMOBILE FINISHES.** This strip can be used for exterior purposes as well as for general commodities. Finishes are unusually color fast in sunlight, resistant to heat and cold and successfully pass 500 hour, 90°, 20° salt spray test without lifting or blistering.

**STOCK SPECIFICATIONS.** Mill quantities available in several aluminum alloys and tempers up to 8" wide, maximum; nominal thicknesses.



**Simplifies Forming . . .  
Eliminates Painting . . .  
Makes Products More Saleable**

**...why not investigate the possibilities of Hunter Douglas Pre-Painted Aluminum Strip now!**



**Hunter Douglas Aluminum Corporation**

Detroit Sales Engineering Office:  
16722 E. Warren Ave., Tuxedo 2-0232

HUNTER DOUGLAS ALUMINUM CORPORATION • DEPT. AI-5, RIVERSIDE, CALIFORNIA • TELEPHONE Overland 3-3030



# News of the MACHINERY INDUSTRIES

By Thomas Mac New

More Efficient Facilities,  
Higher Rates of Capacity  
Utilization, and New  
Processes Have Enabled  
Builders of Machinery  
to Hold Prices to a Minimum

## Buy Now— Machinery's Cheap

Machine tool orders are up, the plants are shipping more machines, and the backlog is backing up. The National Machine Tool Builders' Association attributes the increased business to a universal awareness, throughout industry in general, of the need for reducing costs and improving productivity.

Actually, machinery prices are very favorable in comparison with the cost of labor. Even in the plants of the metalworking machinery manufacturers, wages have gone up some 30.8 per cent since 1951. Machinery prices on the other hand have only been increased by 18 per cent, even with the added wages, higher costs of materials, and other general price hikes added to the cost of doing business. Machinery producers have invested a great deal in more efficient facilities, higher rates of capacity utilization, and new processes. These are the things which widen the gap between the price-wage ratio. As MAPI—Machinery & Allied Products Institute—points out, it is principally increases in productivity in the manufacture of equipment that have made it possible for prices to rise at a lesser rate than wages.

If industry is skeptical, it should look over some of the recent figures compiled by MAPI on the price-wage picture in the machinery field. Not many realize that the cost of machinery is way down relative to the cost of an hour's labor—based on the national average of all U. S. business. Since 1941, just about one-third has been shaved from the price-wage ratio of all machinery.

## T & D Shops See Record Year

Trustees of the National Tool & Die Manufacturers Association got together recently in Washington to look over the market for 1956. As predicted in this column some months ago,

the picture looks very rosy for the firms selling to the automobile makers—because of 1957 model changes. Putting it in terms of dollars, the tool and die makers should equal or exceed their record year of \$750 million in 1953 for all tool and die business. Members revealed that only 15 per cent of the orders on the books is for the defense program, so the civilian market is bearing the brunt of the new orders. Detroit shops are optimistic over prospects for good business throughout this year and well into 1957.

One sobering note amongst all the optimism was struck by Walter B. Stults, of the Senate Small Business Committee. He declared quite flatly that small concerns in the tool and die industry are not progressing as satisfactorily as the larger companies. The following figures were cited in support of his contention:

	Percentage of Profit Per Dollar of Sales, After Taxes	
	1954	1955 (first 3 quarters)
Firms with annual sales of under \$250,000 . . . . .	0.7%	1.2%
Firms with annual sales of \$100 million or more	6.5%	7.2%

## ASTE Fund Sponsors Plastic Research

The properties of plastics used for tooling applications will be researched under a \$10,000 contract given to the Purdue Research Foundation by the ASTE Research Fund. Cosponsors of the project include Bakelite, Shell, Ciba, and Marblette. One of the most important phases of the program will be devoted to the establishment of standard test methods for measuring and predicting reactions of the variables involved, in order of importance: shrinkage characteristics; abrasion resistance; heat resistance; and physical properties essential in plastics for tooling in stamping and forming.

## One Dissenter at Automation Parley

In Worcester, Mass., last month the ASME held a Machine Design Conference which could really have been labeled an Automation Free-For-All. Everybody talked automaticity and automation for assembly, machining, controls, and research. Only one person, from the United Steel Workers of America, threw a little discord into the proceedings. From what the writer heard, however, the dissenting participant had no real argument to stand on. This was one case where the management members of an automation panel talked down the lone labor member.

Henry Michelsen, development engineer, New Departure Div. of GM, gave a very interesting paper at the conference on automatic assembly in one of New Departure's ball bearing plants. His paper, however, was withdrawn from publication.

Engineers at the conference were told by Richard Melvin, staff engineer for Sahlin Engineering Co., that there are more than 1700 press mounted swing arm type unloaders in some 95 per cent of America's large stamping plants. He also pointed out the range of operations and the design of current iron hand type unloaders. In considering some economic factors, he showed an example where the accident potential on just one five-die line could be reduced by 91,200 hand hours and still obtain a 59 per cent increase in production.

## Now—Gear-O-Mation

That's the name, Gear-O-Mation Div., that Michigan Tool Co. has given to its new division which will design and build automation equipment for high-volume manufacture of gears and other small parts of similar size and contour. Marvin R. Anderson, executive vice-president of the parent, tells us that Fred T. Proper has been named sales manager of the division.

(Turn to page 104, please)

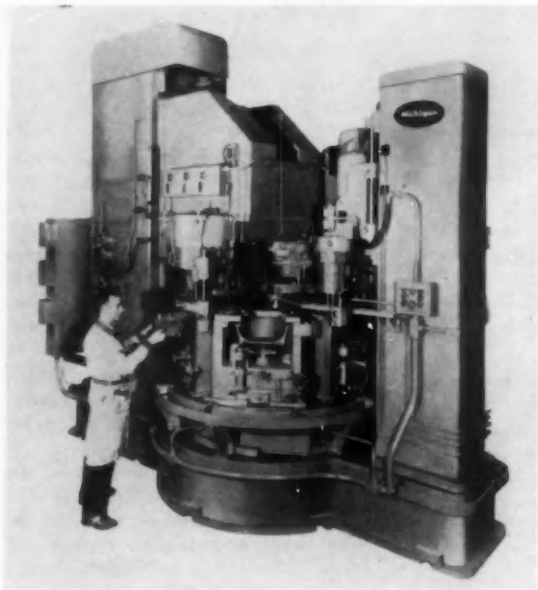
# NEW

# PRODUCTION and PLANT

# EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

## Six-Station Machine for Clutch Housings

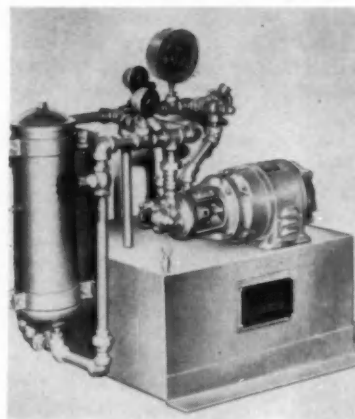


Illustrated is a machine which drills, chamfers, rough and finish bores the starter hole; reams two dowel holes; spot faces four inside bosses; and taps five holes in a V-8 clutch housing. It is designed to complete 120 parts per hour, and with minor tool changes can handle two models. Featured are six work stations, power clamping, elevating type fixtures, and a unique method for chip disposal. Mounted to the periphery to the index table are chip paddles which deliver chips to a single trough at the rear of the machine. (Michigan Drill Head Co.)

Circle 30 on postcard for more data

## Machine Lubricators

A LINE of circulating lubrication systems for providing continuous recirculation of filtered oil to bear-

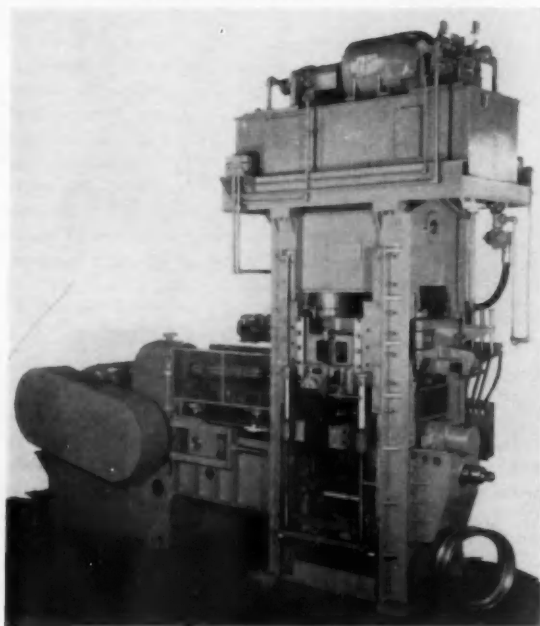


Bowser lubricator

ing surfaces of light, medium and heavy duty machinery, is announced. Called "CS" Systems, they are furnished complete and in each case consist of liquid pump, tank, filter, heat exchanger, control valve and piping. Bowser Technical Refrigeration.

Circle 32 on postcard for more data

## Wheel Rim Roller Is Conveyor-Equipped



This roller, for the automatic manufacture of wheel rims, feeds and transfers the rims into and out of the machine in a straight line by electrically - controlled, pneumatically - operated conveyors. The rim is mounted for rolling automatically on the work rolls. During transfer, the bottom roll retracts automatically and completely on its axis out of the rim's path. The rim transfer devices are integral with the machine. Vertical motion of the conveyor is obtained by direct connection with the top ram. The pneumatically - operated side and center guides are also mounted on the upper ram. (McKay Machine Co.)

Circle 31 on postcard for more data

## Test Chamber

THE extreme high heat developed by skin friction on high altitude missiles has led to the building of an altitude simulation test chamber with a temperature range of from -100 F to +500 F, without modification. It incorporates a 64 cu ft test space, with features including completely automatic operation, air circulation, mercury monometer calibrated in thousands of feet, and a safety thermostat to protect heaters against accidental burnout.

The chamber is said to provide accurate simulation of atmospheric conditions at high altitude under ultrasonic velocities, and the controls are designed to duplicate the results of rapid changes in acceleration. American Research Corp.

Circle 33 on postcard for more data

## Piston Sizing Gage

**A**N electronic gage that measures taper and outside diameter on automobile pistons, then stamps a code letter on the piston to identify the diameter, has been introduced.

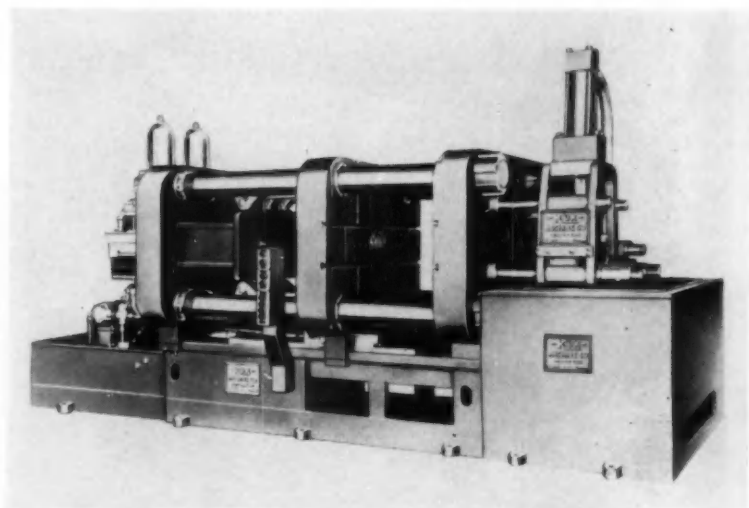
It takes both measurements, i.e., taper between the top and the bottom of the piston skirt and the OD at the upper end of the skirt. However, if the taper measurement is not within tolerance limits, the gage's electronic classifier will ignore the diameter measurement and the part is rejected. If the taper is satisfactory, there are six good diameter classifications differing by 0.0003 in., plus oversize and undersize. Signal lights for each diameter classification enable the operator to see which category a particular piston falls into, and an ink-impregnated stamper unit stamps the code letter indicating the diameter on the piston itself.

This model, designated as No. 144 B-83, is a semi-automatic gage, in



Federal piston gage

which the gaging and stamping action is entirely automatic, but the parts hand-fed and hand-disposed. Gages with fully automatic feeding and sorting units are available. With this model, the operator places a piston on a precision-ground locating plug which assures centralization of the part in the gage. After the part is located, a switch is tripped which starts a vibrator that settles the part firmly between the gaging contacts. Both the taper and diameter measurements are made simultaneously and the electronic classifier receives the size signals from the gage heads. The classifier lights the proper signal



Kux Model BH-60, 1000-ton die casting machine

## Large Die Casting Machine

**A** 1000-TON die casting machine, one of the largest produced for general industry use, has just been introduced. The Model BH-60 has a weight of 79,000 lb, with 10-in. thick solid steel die plates each weighing over 10,000 lb. These die plates, measuring 72 by 54-in., provide a die space of 40 by 32-in. clearance between tie bars, and there is a die opening stroke of 24-in., adjustable for less stroke if desired. The machine is constructed either in a plunger gooseneck design for the production of zinc castings, or as a cold chamber design for aluminum and magnesium die castings.

The new hydraulic system provides,

for a machine of this large size, a fast operating cycle. The system is capable of putting the machine through eight free cpm with injection pressures of up to 32,000 psi, and injection speeds of up to 1000 fpm.

A one-piece automotive grille weighing 26 lb as cast, and measuring 59 by 12-in., is presently being made in zinc on this machine. It is capable of injecting up to 49 lb of zinc, and more than 14 lb of aluminum into the die, with only the movement of electric pushbuttons required for a fully automatic cycle of operation. *Kux Machine Co.*

Circle 35 on postcard for more data

light and activates the stamper unit. When the piston is released by the stamper, the operator places it in the disposal box as indicated by the signal light. The gaging cycle takes approximately 4½ sec. *Federal Products Corp.*

Circle 34 on postcard for more data

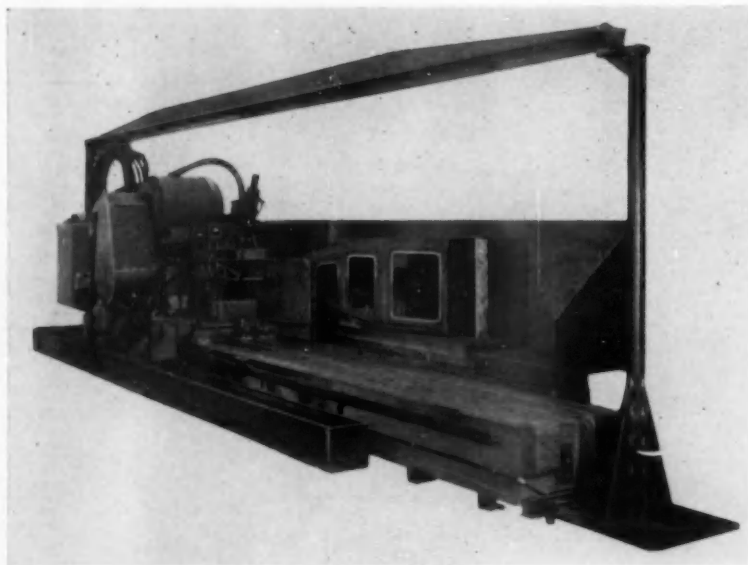
## Hardfacing Powders

**N**ICKEL base alloy powders for hardfacing that can be sprayed from various types of guns and applied to practically all metals with melting points above 1850 F, have been developed. Called Hi-C Spray Powders, the new product is said to provide a homogeneous deposit of high hardness with excellent resistance to wear, corrosion and oxidation at high temperatures. The spray powders permit the selection of Rockwell C hardness re-

quired, and the number following the Hi-C designation indicates the hardness. For example, Hi-C 60 spray powder has a minimum Rc scale hardness of 60. The powders are available in hardnesses of 40, 50 and 60.

Advantages listed by the company for these powders include longer life for parts such as cams, pump parts, push rods and similar items; low coefficient of friction; uniform deposit with extremely hard chromium boride particles in a hard, corrosion-resistant matrix. More than 80 per cent of hardness is said to be retained at 1000 F, and approximately 70 per cent at 1400 F. Oxidation resistance is reported to be good for long periods of time at temperatures as high as 1800 F. Fused surfaces sprayed with Hi-C powders may be hot-forged. *Western Carbide Corp.*

Circle 36 on postcard for more data



Mattison "UK" traveling wheel face grinder which has been redesigned for increased capacity.

### Redesigned Traveling Wheel Face Grinder

**P**RECISION grinding of long or bulky workpieces at 90 deg to the wheel face is possible with the "UK" traveling wheel face grinder, which has been redesigned to provide greater horsepower for heavier stock removal and a heavier carriage for improved precision. In operation, the part is clamped in a stationary position and the grinding wheel passes over the surface to be ground. The stationary

table permits the use of heavy fixtures and clamps. Work of almost any length can be ground, because one end is supported by the table and the other end by supplemental blocking.

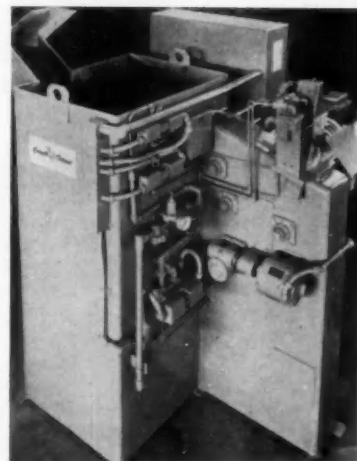
Carriage ways are one-third longer and wider in the redesigned machines. The carriage is now driven by a variable volume piston-type hydraulic pump in conjunction with a vane-type fluid motor. Complete control of

all machine functions is governed by a servo mechanism. Rate of speed, start, stop, inching, and positioning for unloading are controlled by push-buttons from the operator's seat on the traveling wheel carriage. Speed of the carriage has been increased to a range of 10 to 100 fpm. Horsepower driving the grinding wheel has also been boosted. Precision performance possible with the new machines is cited by the fact that in grinding the vertical column of a machine flatness was held to within 0.0004 in. over a 60-in. surface. *Mattison Machine Works.*

Circle 37 on postcard for more data

### Hopper Feeder

**T**HIS hopper feeder receives parts, such as gear blanks, bearing races, pistons and screw machine products, in bulk, with random orientation; and discharges them, orientated and aligned, to the following machine on demand of the latter, according to a recent announcement. Its design, which incorporates a slicer bar, is



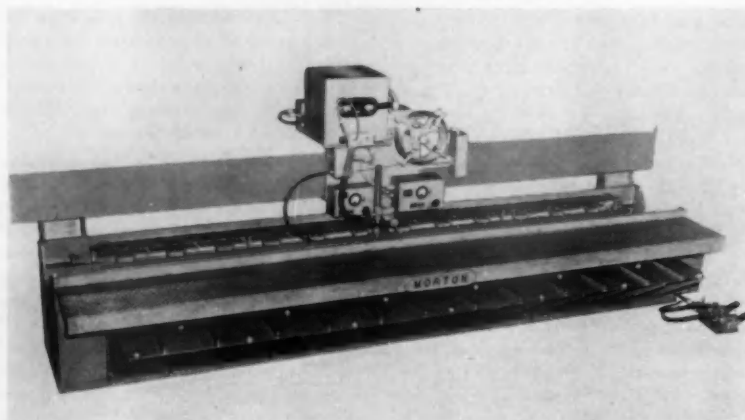
Cargill hopper feeder

standardized so that no basic engineering changes are said to be required to couple the feeder to a range of machines, processes, and parts sizes and shapes.

Where desired, the unit (as illustrated) can be equipped with a conveyor system which will elevate parts up to 15 ft and deliver overhead to a machine as far away as 50 ft. The hopper feeder can also be equipped with a gage to reject parts that do not meet specified tolerance. *Cargill Detroit Corp.*

Circle 39 on postcard for more data

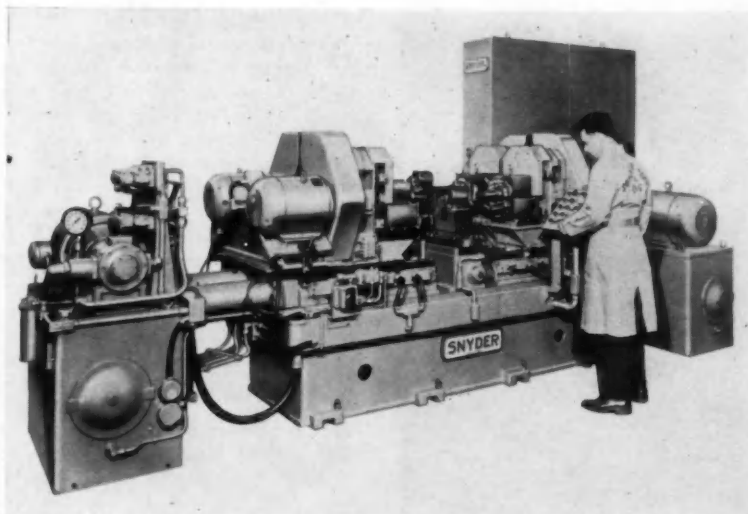
### Seam Welder Joins Long Sheets



The stake welding machine shown is designed for automatic arc welding of long flat sheets. It includes side loading platforms with ball transfer rolls to aid in material handling and features such as positive clamping, accurate gaging and water-cooled copper back-up bar. The machine will handle flat stock up to 1/4-in. thickness. Various lengths and heights can be supplied. (*Morton Manufacturing Co.*)

Circle 38 on postcard for more data





The Snyder eight-spindle, two-way precision boring machine finish-bores 19 different cast iron power take-off transmission cases.

### Two-Way Boring Machine is Versatile

**A**N eight-spindle, two-way precision boring machine that finishes nineteen different semi-mass produced parts with a variety of bore sizes and center distances, has been announced.

It has two fixtures that enable the boring of up to four holes at each fixture location and the production of a finished part with each cycle of the machine. Each two-spindle boring head is a separate slide unit and can be operated manually, automatically, individually or in combination with other heads in an automatic machine cycle, thus providing flexibility of operation for parts in small quantity production. A finished part can reportedly be produced in an automatic cycle in 50-sec floor-to-floor time on the electrically-operated hydraulically-controlled machine.

In automatic operation and after the machine has been adjusted for correct size, center distance, spindle speed and work fixture location for producing a particular part, it is loaded in the front work fixture and the machine cycle button operated. The magnetic chuck in the work fixture is automatically energized and the heads at each end of the machine travel forward at rapid advance, feed into depth and retract. Then the work holding magnetic chuck is de-energized and the part placed in the rear fixture for the boring of two more holes in the part. Another un-bored part is placed in the front fixture and the automatic cycle button is again operated. This machine cycle

finishes the part on the rear fixture and thus further operating sequences produce a part with each cycle of the machine.

When the machine is run manually, controls are provided to enable the

manual energizing and de-energizing of the work holding fixtures.

A 3-hp motor drives the two spindles in each head. Two speeds can be had on the lower spindle of each head and three speeds are possible for the upper spindle by adjusting belts. Electrical controls for the machine are in a control panel at the rear. All push-button controls are in a compact panel at the operator location. Snyder Tool & Engineering Co.

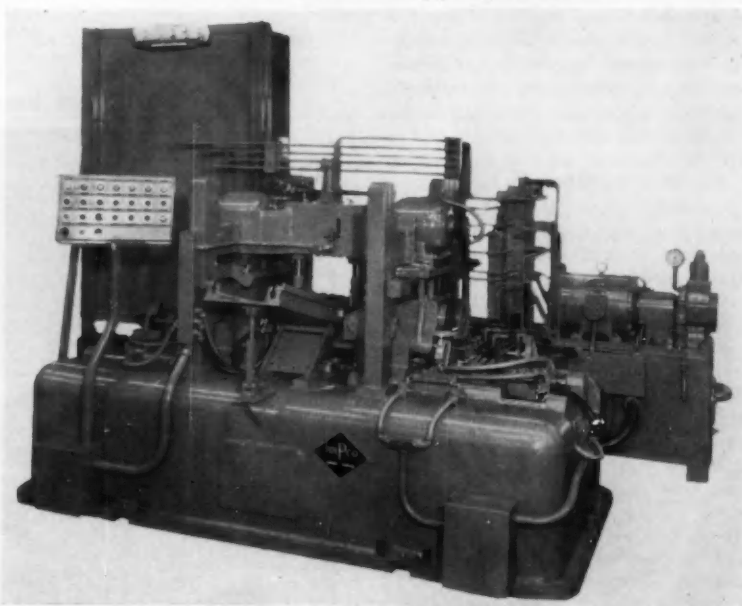
Circle 40 on postcard for more data

### Dial Indicator

**T**HE addition of a newly-designed dial indicator, Model 21019, that will give accurate readings to within 10 millionths (0.00001-in.) is announced. It is graduated in 50 millionths (0.00005-in.) over a measuring range of 0.002-in. Bezel size is 2¼-in. The precision action of the indicator is said to result from simple construction and jeweled movements protected by a shock-proof system. It is made to AGD Group 2 mounting specifications. Decimal graduations in black are on glare-free aluminum white dials. The indicator is anti-magnetic. Petz-Emery, Inc.

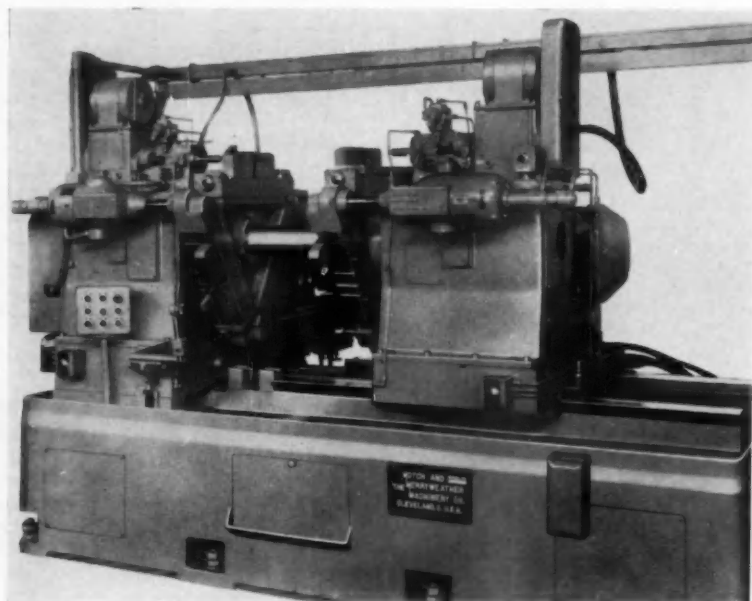
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### Automatic Center-Lapping Machine



In the operation of this machine, parts are fed from a conveyor onto an inclined magazine loader, then set automatically in the workholding fixture, hydraulically clamped, center-lapped on both ends, and ejected onto the unload track at the rate of 300 pieces per hour. (Industrial Metal Products Co.)

Circle 42 on postcard for more data



Match & Merryweather Model MCT-3 automatic milling and centering machine

### Automatic Milling and Centering Machine

A UNIVERSAL production type machine, designed to meet the demands of tracer-controlled and automatic lathes, the Model MCT-3 can be set up for lengths to 48-in. and drills to a depth of four in. if desired. Two triangular fixtures with six trunnion vises index 120 deg between three stations. Station one is for loading and unloading. At a second station, double-end center drilling takes place. The three operations—load-unload, mill and center drill—are simultaneous and in this order.

The three-station indexing fixtures are mounted on anti-friction bearings keyed to a steel shaft with automatic indexing by hydraulic power. Hydraulic-electric torque wrenches are mounted on either side of the trunnion, arranged for quill movement to engage the screw-actuated, self-centering vises for clamping and unclamping. When the trunnion has indexed to station one, the wrenches advance, engage the vise screws and open the vises. When the next part has been positioned and the start cycle button depressed, the torque wrenches reverse, clamping the part, and then retract, permitting the trunnion to index.

The machine is arranged for automatic cycle, with parts being manually loaded into the work-carrying fixture at the front of the machine, then progressively indexed to the

milling and drilling stations, and back to the front of the machine for unloading. As an added accessory, automatic loading and unloading can be incorporated to automate fully the milling and centering operations. *Match & Merryweather Machinery Co.*

Circle 43 on postcard for more data

### Alignment Interferometer

AN experimental alignment interferometer to measure changes in angle of arc to 0.000001 (one millionth) in. accuracy has been developed. The company reveals plans to build a limited number of the new instruments and provide in-plant demonstrations for prospective users. Production models will then be built around the experience with these prototypes.

The instrument is a double-beam interferometer built to detect small changes in angle through a total range of 30 sec of arc. In operation, light beams from within the main body are reflected back from a mirror that can be located as much as 14 ft away. The unit can be rested on its base, side, or end to measure the alignment of jigs, fixtures, or flat bed surfaces. The 30 sec of arc range is graduated as plus or minus 15 sec intervals around a central zero point. The least scale reading is 0.2 sec of arc, and the maximum accuracy is 0.000001 in.

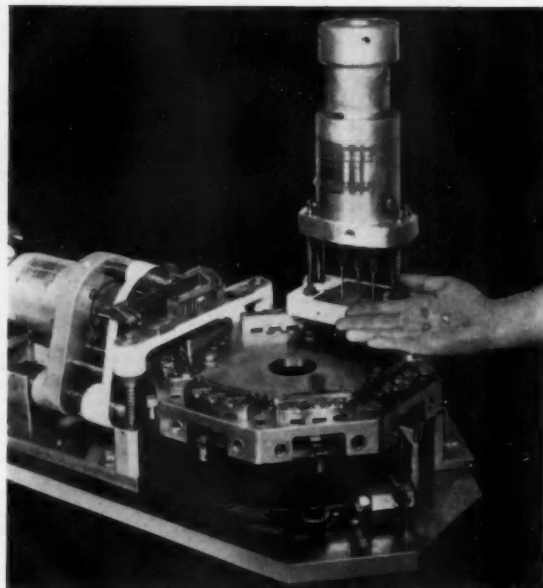
Readings are obtained by setting the interferometer and mirror into zero alignment. When the mirror is moved, fringes are observed through the eyepiece and brought back into the zero alignment position by resetting the measurement scale, which then indicates the change in the angle of arc. *Bausch & Lomb Optical Co.*

Circle 44 on postcard for more data

### Holes Drilled in Small Parts Simultaneously

An eight-station rotary indexing table facilitates the processing of the parts shown. Two gearless multiple-spindle drill heads are used, one vertically mounted to ream two holes and one horizontally mounted to drill a hole in the side of the part. Three pieces are held in each of the eight stations and the holes are drilled simultaneously in three pieces. The two holes through the part are on 5/16-in. centers and are 1/16 and 3/32-in. diam. The side hole is a #55 diam drill through a 1/16-in. section. Loading is manual; progressive indexing and ejection are automatic. Production is rated at 1200 pieces per hour. (*Zagar, Inc.*)

Circle 45 on postcard for more data



## Blast Cleaner

**A**NNOUNCEMENT is made of a monorail-type blast cleaner for handling parts with internal open cavities that are difficult to clean completely. A typical application is the cleaning of engine blocks. The model UB machine, an airless abrasive unit, features more efficient use of the abrasive and fewer centrifugal abrasive-hurling wheels.

It places the work to be cleaned in such a position that cavities are exposed to the abrasive shower from a single wheel during the entire period the piece is in blasting position. In the application cited, the crankcase cavity gets the abrasive blast from one wheel during the block's entire rotation; and the valve section and the sides of the block are exposed to two hurling wheels in the cabinet sidewalls.

Other design developments included are double chain drives to increase rigidity of the work-holding hooks on the conveyor and reduce swaying of the work in the blasting compartment; and newly-designed traveling seals for more efficient prevention of abrasive leakage around the monorail conveyor mechanism. *Wheelabrator Corp.*

Circle 46 on postcard for more data

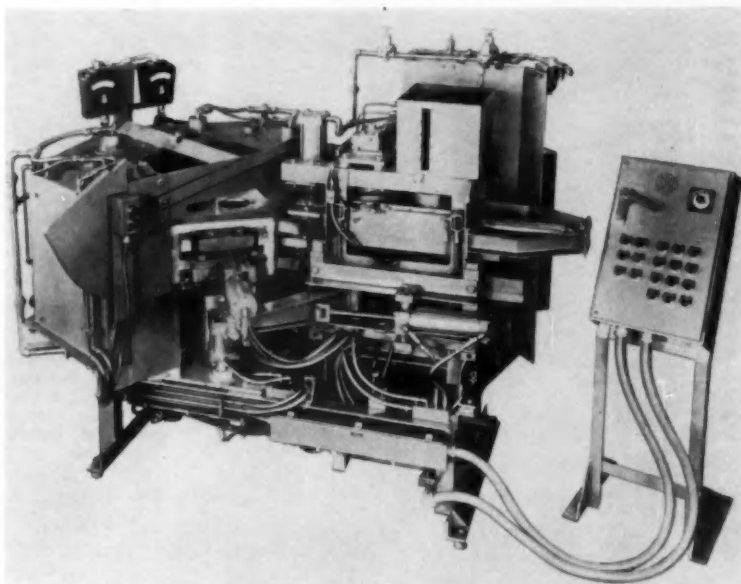
## 250-Ton Press

**T**HE double crank open back gap press illustrated is mounted on separate legs so that the body of the press can, if desired, be set in an inclined position to make use of the open back feature for gravity discharge of finished pieces. This is a modification of the upright position in which it is usually furnished.

The machine, which is single geared, single end drive, is equipped with a single station electrically controlled air operated drum type friction clutch with spring loaded brake. The fly-wheel is fitted with an auxiliary air brake to bring it to a stop when the power is shut off, and the slide is counterbalanced by air. A centralized manually operated lubrication system is provided within easy reach.

The press has a capacity of 250 tons, a stroke of 16-in., adjustment to the slide 10-in., distance bed to slide (stroke down, adjustment up) 37-in., and a bed of area of 42 by 72-in. It is also equipped with a pneumatic cushion in the bed which has a capacity of 42 tons at 100 lb air pressure. *Cleveland Punch & Shear Works Co.*

Circle 47 on postcard for more data



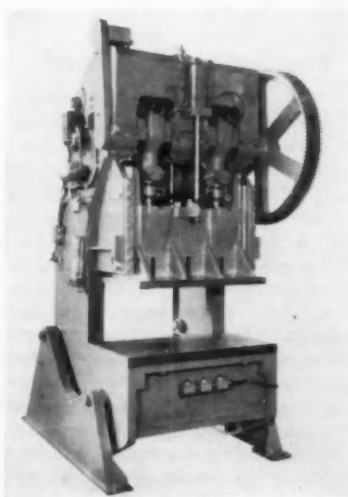
*Spo Model SC-10-R rotary hollow core machine features six core boxes and automatic operation*

## Machine Mass-Produces Hollow Cores

**T**HE development and availability of a multi-station rotary-type machine designed to produce hollow cores has been announced. This unit, designated Model SC-10-R, has been developed to provide foundries with a high-speed automatic machine capable of producing accurate ready-to-use hollow cores in large volume. Its complete cycle is 15 seconds or less.

The unit accommodates six core boxes up to 10 by 12 by 6 in. All operations, except for removal of the finished cores, are automatically controlled. The machine also features an automatic thermostatically-controlled oven and insulated oven-sealing doors to maintain constant curing temperatures for blown cores. *Spo, Inc.*

Circle 48 on postcard for more data



*Cleveland double crank open back gap press*

## Air Tool Muffler

**E**XTENSION of the "Silentair" principle to screwdrivers and nut setters in its No. 2 series of air-driven tools has resulted in a noise reduction of 75 per cent, according to a company announcement. The recently developed exhaust muffler is a steel sleeve, with 24 perforations, providing a large expansion chamber for exhaust air before it reaches outside atmosphere. Coupled with an internal three-stage muffling system, the sleeve and its acoustical pattern of holes are said to break up and absorb the air motor's sound. The result is reported to be a middle-level hum compared to the high-pitched sound of non-muffled air tools. The new muffling sleeve can be installed on units now in use, as well as ordered optionally on new tools. *Thor Power Tool Co.*

Circle 49 on postcard for more data



Turning a few dials and pushing some buttons operates Minneapolis-Honeywell's recently developed automatic drilling machine. Here an operator cuts holes in a steel sheet for a master control panel. The operator dials the coordinates of hole location and the control system takes over and positions the bed and the multiple drilling head. Drilling is then a matter of button-pushing.

### Electronic Control for Drilling Machines

**A**N electronic control system for drilling machines has been developed which enables an operator to "dial" the "X" and "Y" coordinates of a desired hole location and to perform the drilling operation by pressing a button. It is currently being used to drill holes for mounting instruments and dials on master panel boards.

The system consists of dials with which the operator sets the desired "X" and "Y" coordinates. A traveling drill head and movable table permit positioning of the cutting tool over the workpiece. Both can move up to four feet perpendicularly permitting any point in a four by four foot area to be machined. "Step" methods permit handling of larger sheets. The drill head is equipped with a multiple spindle attachment. It can simultaneously drill up to five holes of varying dimension, with an accuracy of 0.005 in. A variable speed motor provides spindle speeds for drills as small as 1/32-in. Use of a belt reduction permits sawing or fly-cutting of holes up to six in. This makes it possible, company engineers explain, to machine both the clearance hole and mounting holes for a pressure gauge or other instrument at one pass.

The drill head and table are positioned by conventional positional servo-mechanisms, controlled by dials on the control console. Other controls provide for jogging all machine motions, control of spindle speed, sequence of drilling operations, and

permit choice of constant feed or constant thrust drilling. Reset controls are also provided to return the head and workpiece to a location convenient for the operator following single operations. Indicator lights show the position of the head and the table relative to the "called-for" position. They also give the operator a visual indication when the cutting head is in its proper location. The head and cross-rail assembly can be raised or lowered to accommodate panels of various heights and shapes. *Minneapolis-Honeywell Regulator Co.*

Circle 50 on postcard for more data

### Pneumatic Slide Feed

**N**EWLY designed, a smaller air-operated slide feed with open throat, for automatic feeding on light punch presses, is now available. Called Model M-256, it operates on shop air lines at 50 to 100 psi, and takes materials up to a maximum thickness of 1/16-in. and to maximum widths of 6-in. in lighter gages. The unit has a maximum feed length of three inches, operating at 200 strokes per minute, and will feed at correspondingly higher speeds when shorter feed lengths are used. Simple to set up, only one screw adjustment is necessary. While it operates off the press crankshaft, the length of the press stroke does not affect the feed length. *Cooper Weymouth, Inc.*

Circle 51 on postcard for more data

### Mold and Core Binder

**D**EVELOPMENT of an improved silicate-based sand binder for the production of molds and cores is announced. Known as "Moroc," it is said to represent a departure in chemical formulations from approaches to silicate-based binders followed heretofore. Advantages as a bond are stated to include no separation in storage, low viscosity permitting easy mixing, good bench life, better gas reaction, and good collapsibility. Its use in mold and core production gives other advantages, it is also said. Baking or drying operations are eliminated, molds and cores with greater dimensional accuracy are produced, and castings with superior finish are made. *The Delhi Foundry Sand Co.*

Circle 52 on postcard for more data

### Air Valve for Presses

**A** NEW model dual air valve, designed to actuate the clutch and brake of mechanical power presses, is said to eliminate one of the chief hazards of mechanical press operation—accidental stroking due to valve failure. Designated Model No. 2545C, it has been simplified, many of its components strengthened, its overall size reduced, and requires less power to operate, according to the announcement.

The valve consists of two elements working independently in parallel,



Danly dual air valve

and cross ported with large exhaust outlets. Should either element fail, the clutch will be exhausted and disengaged normally through the second valve element. The safety factor of the valve is reportedly not dependent on its mechanical life. *Danly Machine Specialties, Inc.*

Circle 53 on postcard for more data



## Welding Head

**T**HE Model C Heliweld automatic head, recently introduced, provides a completely automatic weld cycle. A single switch causes the holder to move downward and start the arc, and the arc length is maintained constant throughout the weld. Electronically controlled, this new unit is primarily designed for d-c Heliwelding with argon or helium shielding gases, or a mixture of the two. It can also be used for a-c Heliwelding with the Airco Heliwelders or the Airco Heliweld Bumblebee arcwelder (when a-c adapting equipment is added). Heliwelding is a tungsten inert-gas arc-welding process for joining light gages of stainless steel, mild steel, aluminum, brass, copper, titanium, beryllium, Everdur, nickel, Inconel and Monel.

The assembly consists of a head with a 32 in. long machine holder which accommodates electrodes from 0.040 in. to 5/32 in. diam up to 24 in. long, a main control panel, and a remote control operator's station. Water and gas controls are included in the main control panel. The arc length (distance between electrode and work), once set, is maintained by automatic up and down movement of the holder to follow irregular surfaces. The head can be operated in the horizontal as well as in the vertical (normal) position. The holder can be tilted, by means of a micro-positioner, six degrees either side of center. Both touch starting and high-frequency-type starts (electrode does not touch work) are available. *Air Reduction Co., Inc.*

Circle 54 on postcard for more data

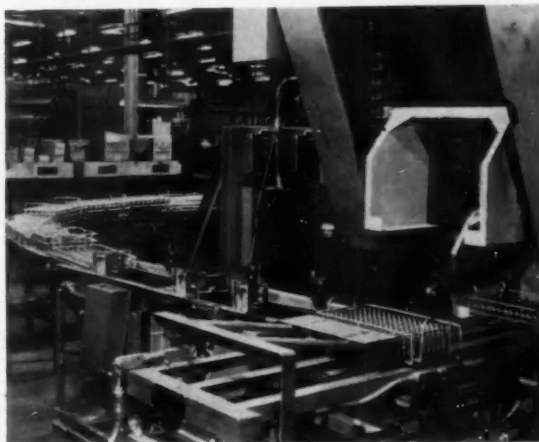
## Speed Increaseers

**T**wo speed increaser units are now being offered. Listed as Series 4030 and Series 4000, they are specifically designed to meet the requirements of aircraft test equipment; and feature quiet, vibration-free operation and long life.

Series 4030 provides speed increase ratios from 1:2.0 to 1:6.84, and up to 200 hp transmission with output speeds to 12,000 rpm. Series 4000 provides speed increase ratios from 1:1.0 to 1:5.19, and up to 50 hp transmission with maximum output speeds to 30,000 rpm. Both units have forced flow lubrication. *Snow-Nabstedt Gear Corp.*

Circle 55 on postcard for more data

*Circo automatic basket feeder carrying parts-laden metal baskets into entrance of conveyerized vapor degreaser. Automatic unloader at exit end returns baskets to gravity roller conveyor.*



## Automatic Basket Feeder and Unloader

**A** SECTIONAL automatic feeder and unloader for transferring product-laden baskets to and from standard conveyor systems and process machinery has been introduced. It is designed for production-line loading and discharging of baskets into and from automatic washers, conveyerized degreasers, inspection pre-treating systems, dryers, heat-treating equipment, etc.

The feeder section and unloader section are available as independent

units for basket movement involving one-stage basket transference from one conveyor to another, or for simple flow-line switch-over. Both units come complete, are internally coordinated to prevent out-of-step feed, and can be operated at any practical speed. Limiting devices and safety stops are integrally linked with the systems they service to shut down and signal a fault if it should occur. *Circo Equipment Co.*

Circle 56 on postcard for more data

## Wet Dust Collector

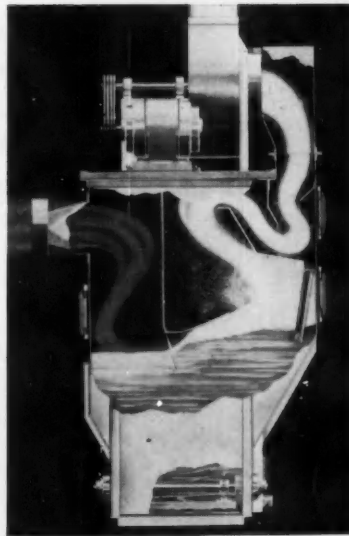
**F**OR controlling industrial dusts, the "Ventrijet" wet dust collector, now being manufactured, is said to achieve the proper atomizing of water and mixing with the air stream to permit efficient dust transfer by the movement of air, without mechanical means.

Dust laden air enters the collector and expands in the inlet chamber at reduced velocity. The heavier particles sink to the bottom of the tank as sludge. The air is drawn through one or more venturi tubes into the discharge chamber, and the low pressure area in the venturi throat induces water also to enter the high velocity air stream. This mixing of air and water causes the transfer of dust particles from the air to the water particles. The air, water and sludge mixture impinges at high velocity on special surfaces in the discharge chamber, and the sludge settles to the tank bottom. The washed air then flows through an eliminator section for removal of droplets, and clean air is discharged.

The unit is available in a range of

capacities from approximately 1,000 to 30,000 cfm in single and double row tube types. *Pangborn Corp.*

Circle 57 on postcard for more data



*Pangborn dust collector*

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## FREE LITERATURE

### Control Equipment 1

Catalog D-31, 19 pages, describes and illustrates differential transducer control and automation systems, and a line of time control equipment including valves, counters, and electronic contactors. *Automatic Temperature Control Co., Inc.*

### Solenoid Valves 2

Bulletin SK356, 6 pages, covers the operation and application of single and double solenoid valves. It also includes tables which give pressure ranges, condensed specifications and dimensions. *Valvair Corp.*

### Cemented Oxides 3

A four-page technical report, GTO-103, includes latest information for applying cemented oxide tool materials (Grade 0-30). Listed are tool holders required, metals machined to date, cutting angles, chip control, cutting speeds and feeds, coolants and regrinding. *Carboloy Dept., General Electric Co.*

### Lubricators 4

Semi-automatic lubricators that can service as many as 100 bearings on a machine are described in Bulletin 3C, four pages. *Bijur Lubricating Corp.*

### Holding Devices 5

Catalog 156, 24 pages, provides a complete listing of a line of tool holding devices, with typical applications. *Heinrich Tools, Inc.*

### Gear Shaver 6

A rotary gear shaving machine for external or internal spur and helical gears is described in Catalog S-56-1, 12 pages, illustrated. *National Broach & Machine Co.*

### Grinder Wheel Forming 7

An attachment for making and re-truing complex forms on grinding wheels is described and illustrated in a four-page circular made available by *Pratt & Whitney Co., Inc.*

### Neoprene 8

Prepared primarily for automotive engineers, 12-page booklet A-1265 discusses applications in which neoprene has been successfully used. *E. I. du Pont de Nemours & Co.*

### Cold Forming 9

A cold-forming, double extrusion process for cap screws and other shapes is described in a four-page folder issued by *Cleveland Cap Screw Co.*

### Casting Aluminum

A new technical handbook, 130 pages, contains information for helping designers to select the casting process and aluminum alloy best suited for product requirements. Write on company letterhead to *Reynolds Metals Co., Desk PR4810, 2500 South Third St., Louisville 1, Ky.*

(Please turn page)

5/15/56  
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## Tap Guide Chart 10

Tap pitch tolerances, tap drill sizes, tapping speeds, tapping lubricants, rake angles, and decimal equivalents are included in twelve tables arranged for quick reference in calendar style for wall mounting. *Wood & Spencer Co.*

## Special Bearings 11

Information on anti-friction bearings for special applications is provided in Catalog AFB-1, recently released by *Industrial Tectonics, Inc.*

## Die Casting Alloys 12

A 23-page reference book on die casting alloys includes mechanical requirements of various zinc alloys as their physical and mechanical properties. *Henning Bros. & Smith, Inc.*

## Resistance Welders 13

Bulletin 335-1, eight pages, offers complete descriptions of a new spot welder and a new projection welder. *Sciaky Bros., Inc.*

## Roller Bearings 14

Catalog 55, 72 pages, contains specifications and reference data for various models of roller bearings with shaft sizes ranging from  $\frac{3}{4}$  to 7-in. *Chain Belt Co.*

## Molybdenum Carbides 15

Bulletin Cdb-7 summarizes the properties and preparation of molybdenum carbides and nitrides for such applications as cutting tools, thermocouple protection tubes, shot blasting nozzles, bearing surfaces, and die facing. *Climax Molybdenum Co.*

## Adhesives, Coatings 16

U. S. Government specifications for a variety of adhesives, coatings and sealers are listed in file type form along with the corresponding 3M product that meets the specified requirements. Fourteen pages. *Minnesota Mining and Manufacturing Co.*

## Hand Feed Threaders 17

Hand feed threaders are described and illustrated in Circular 931-A-2. The machines are designed to roll greater lengths of thread than can be handled on automatic thread rollers. *Waterbury Farrel Foundry & Machine Co.*

## Industrial Signals 18

The proper selection and use of visual and audible signals for manufacturing plants is discussed in Bulletin 100, recently issued by *Federal Sign and Signal Corp.*

## Cemented Carbides 19

Catalog 2, 20 pages, lists cemented carbide blanks, including those for reamers, lathes, boring tools, roll turning and milling cutters. *Firth-Loach Metals, Inc.*

## Die Casting Machines 20

Die casting machines, which can be furnished either as cold chamber or hot chamber types, are covered in eight-page descriptive bulletin available from *Cleveland Automatic Machine Co.*

## Silicone Guide 21

A 1956 reference guide lists 150 silicone products. They are indexed and grouped according to their physical form: fluids, compounds, greases, resins, and rubbers. *Dow Corning Corp.*

## Tubing Alloys 22

Six-page folder, TDC-163A, furnishes information on various tubing alloys for elevated temperature service. *Tubular Products Div., Babcock & Wilcox Co.*

## Folders and Brakes 23

Bulletin 74C, eight pages, presents a modernized line of folders and brakes, both air-actuated and hand-operated models. *Niagara Machine & Tool Works.*

## Electric Motors 24

Bulletin GEA-6355, 12 pages, illustrated, describes the new 1 to 150 hp d-c Kinematic motors. *General Electric Co.*

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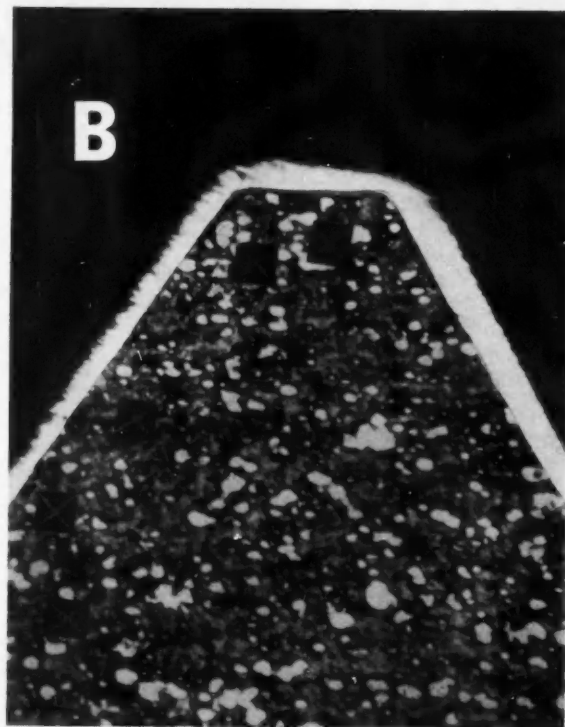
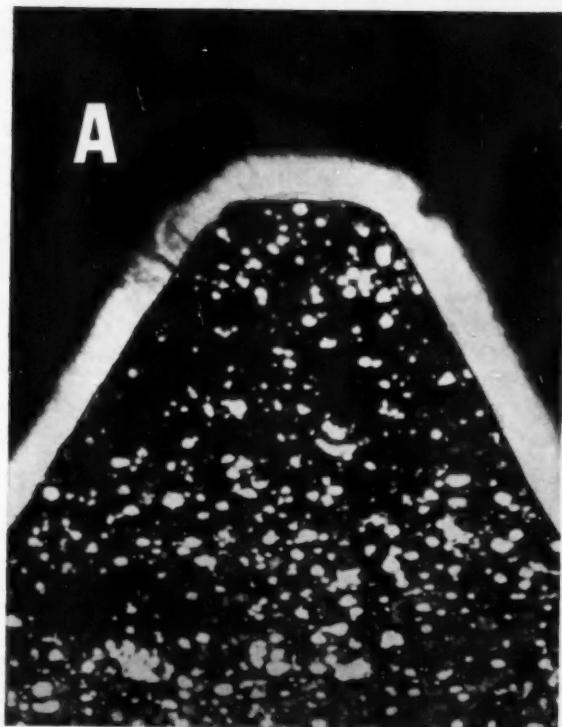
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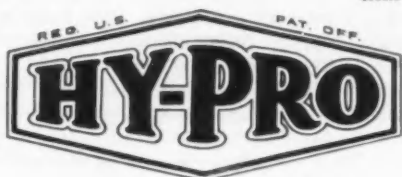
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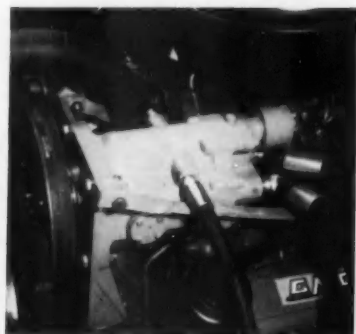
# PRODUCTS

## AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

### Constant-Speed Drive

A truck refrigeration drive featuring full capacity at all engine speeds, has been announced. Three units comprise the system: a hydraulic pump; a 1½ qt oil reservoir including a filter; and the fluid motor which drives the compressor. While the input speed of the engine drive to the pump may vary in a range from 450



to 3000 rpm, the output speed of the fluid motor is said to hold constant at 1800 rpm, within a range of 200 rpm. No heat exchanger is required, nor is oil by-passed in the system.

Automatic temperature control is possible by connection to the cooling system thermostat. The engine can be started with no load imposed by the pump. A built-in delay in the hydraulic system starts the compressor smoothly without shock. While the drive is built to transmit 3 hp on a continuous duty basis, it will sustain up to 6 hp for starting and short period overloads. At engine idle, the system reportedly transmits power at a peak efficiency of 73 per cent. Sundstrand Hydraulic Div.

Circle 60 on postcard for more data

### Lacquer Solvent

High boiling lacquer solvent, ethyl amyl ketone, is a better solvent for nitrocellulose and provides excellent blush resistance and diluent tolerance with high solvency for coating materials, according to a recent announce-

ment. EAK is said to be colorless and stable, with a mild odor. Applications include use in automotive lacquers and vinyl coatings. It is obtainable in quantity. Shell Chemical Corp.

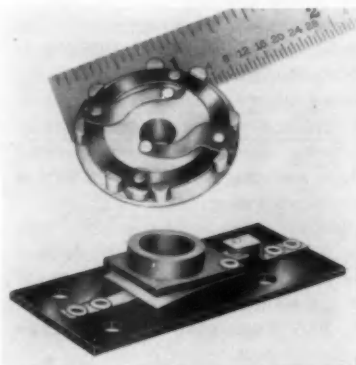
Circle 61 on postcard for more data

### Control Device

Developed as a protective device for electronic equipment and computing units, this new miniaturized Syncro-Snap speed control measures only 1-1/16-in. in diam. Its operation is based on the same principles as the larger model centrifugal switches. It features instantaneous snap action and an accuracy to ¼ of one per cent.

The device has the characteristics of requiring a rapidly decreasing rate of pressure to hold the switch in operating position as the predetermined speed is approached. This, combined with increasing centrifugal force, results in a positive, snap action, and opening or closing of the stationary switch contact points, as may be required.

In one application the switch is



mounted on the output side of a blower motor shaft. If for any reason, the blower speed falls below a predetermined minimum, the switch is actuated, which in turn, cuts out all equipment in the main circuit. Torq Engineered Products, Inc.

Circle 62 on postcard for more data

### Aircraft Gear Motor

An internally geared air compressor motor, featuring ability to withstand high shock loads, is now being produced for aircraft duty. Constructed of lightweight materials, the motor and compressor are supported by a rigid one-piece pyramidal base. Design-



nated Type GA, the motor operates continually on three-phase, 400 cycle, 208-v ac, and has a take-off speed of 3700 rpm. At sea level it delivers 3.5 hp, with the rating varying to 2.5 hp at 50,000 ft. Weight of the motor is 22 lb. U. S. Electrical Motors, Inc.

Circle 63 on postcard for more data

### Belt Coating

A new organosol formulation, based on Pliovic AO, has been developed for application to the webbing materials used in automobile and airplane seat belts. Pliovac AO imparts to the coating properties which are said to contribute to prolonging the service life of safety belts, including high abrasion resistance and flexibility.

The coating is designed for use in a simple dipping operation. Fabric webbings are immersed in the organosol bath and slowly withdrawn. Drying and fusing operations then follow. The basic formulation also may be modified for use with different types of coating equipment. Goodyear Tire and Rubber Co.

Circle 64 on postcard for more data

## Selector Valves

Three-way selector valves for 3000 psi service are now available in two size ranges, Series 6000 for 1/4-in. and 3/8-in. tubing and Series 6050 for 3/8-in. and 1/2-in. tubing. These sole-



noid-operated units permit flow in any direction and feature a compact porting configuration.

The Series 6000 will handle up to six gallons of fluid per minute. Essentially, this valve is a 3/8-in. unit, but can also be furnished with 1/4-in. ports. The Series 6050 is basically a 1/2-in. valve, but can be furnished with 3/8-in. ports for use where low pressure drops are required, or where higher rates of flow are encountered.

The flow can be reversed between any two open ports without disturbing the flow or operating characteristics of the valves. This is accomplished by a balanced inverse poppet which permits a range of flows and pressures in any direction. Both series are provided with single coil solenoids operating in the range of 18 to 30 v dc in accordance with MIL-S-4040A. *Aircraft Products Co.*

Circle 65 on postcard for more data

## Hollow Aluminum Bar

Full-scale production of hollow aluminum bar stock, offering machine tool operators substantial savings over conventional solid bar stock, was recently announced. The aluminum alloy utilized for the new hollow machining stock is 6066, a wrought alloy developed by the company. General characteristics are said to be excellent machinability, corrosion resistance, high strength, and excellent finish.

For most machining applications,

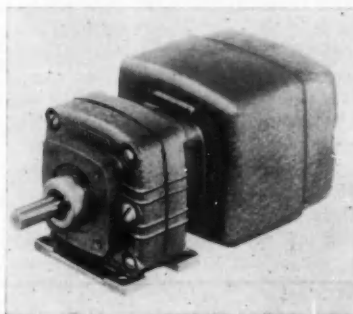
weight of the material reportedly averages less than half the weight of a comparable size in solid aluminum bar, resulting in lower handling costs. Better chip control is an advantage. Because no time is required to rough out a cavity, the hollow stock increases the speed of machining operations. Tests performed demonstrate that the new mill product has superior machining qualities for inside working tools inasmuch as the material has the same cold worked properties on both inside and outside surfaces. Additional advantages offered are high strength (typical yield 52,000 psi) and a better surface for anodizing.

The stock can be obtained without tooling charges in standard round bar in a range of sizes. Diameters of rounds run from 1 through 2 1/2-in. in 1/16-in. increments, and 2 5/8-in. through 3 1/2-in. in 1/8-in. increments. Wall thicknesses for rounds vary from 0.109 to 0.500-in. Other sizes are subject to mill inquiry. *Harvey Aluminum, a Division of Harvey Machine Co., Inc.*

Circle 66 on postcard for more data

## Tachometer Takeoff

Tachometer takeoff heads, Series 33, measure high speeds of 5000 to 30,000 rpm, or low speeds of 1/2 to 100 rpm. A double-pole, double throw switch with a capacitor acts as a speed sensing element. When the

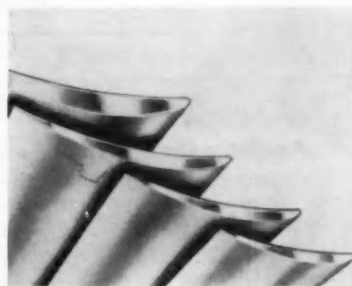


takeoff shaft rotates in either direction, built-in gearing operates the speed sensing element. It produces a current linear with respect to speed. Overall tachometer accuracy is said to be excellent because inaccuracy due to the takeoff head is eliminated for all practical purposes. These takeoff heads also make possible multiple-range tachometers. Since the units use a dpdt switch (not a generator), they must be used with the company's indicator. *Metron Instrument Co.*

Circle 67 on postcard for more data

## Airfoil-Shaped Strip

Airfoil strip, made to close tolerances with fine surface finishes, is being produced. This profile-rolled material is finding use as stator blades for the compressor section of jet engines, and in turbine type applica-



tions, such as hydraulic torque converters.

Standards are met by surface finishing the stock after it has been rolled. Vane strip can be supplied in the "as rolled" condition, surface polished, or finished buffed. Rolled airfoil strip is available in continuous coils, random lengths, and straight lengths (stretcher leveled up to six ft). Widths and tolerances are up to 1 1/2 ± 0.006 in. and 2 1/2 ± 0.009 in.; thicknesses up to 0.30-in. *General Plate Div., Metals & Controls Corp.*

Circle 68 on postcard for more data

## Potentiometer-Recorder

The development of the new Series 8000 electronic potentiometer-recorder of the null-balancing type, a unit completely self-contained and requiring only an external sensing device, has been revealed. It is available in a wide range of models which measure, indicate, control, and give a permanent record of such variables as temperature, speed, strain, hydrogen ion (pH), and other quantities that can be resolved into electrical signals.

Applications of the new instrument will be: (1) for measurement and control of temperatures in the pyrometric range; (2) as a resistance thermometer-type of system; (3) to measure speed; (4) as a radiation receiver (pyrometer); (5) for any function which can be resolved to a d-c signal load and the measurement of pressures through use of a strain gauge (primary element). *Wheelco Instruments Div., Barber-Colman Co.*

Circle 69 on postcard for more data

# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

## Ford Makes Safety Belts Available On Truck Line

Ford has extended its safety features to trucks for the first time. They can be obtained in either of two optional packages.

One will include seat belts, instrument panel crash pad, and padded sun visor, and carry a suggested retail price of \$29.50. The other will include only the crash pad and padded sun visor and sell for \$19.50. A safety mirror will be offered as standard equipment on pickups and express trucks.

## Reichhold Chemical Merges With Catalin of America

Reichhold Catalin Industries, Inc., is the name of the new company evolving from the merger of Reichhold Chemicals, Inc., and Catalin Corp. of America. The latter makes industrial chemicals.

## Full Program, Apparatus Exhibit To Feature June ASTM Meeting

A variety of subjects relating to research and testing of engineering materials will be discussed at the forthcoming 59th annual meeting of the American Society for Testing Materials. The conference will take place at the Chalfonte-Haddon Hall in At-

lantic City, N. J., from June 17 to 22.

Thirty-one technical sessions with eight symposiums are scheduled. In addition, an extensive exhibit of testing and scientific apparatus and laboratory supplies will be held. Hundreds of items from small hand-manipulated instruments through electronic control devices and high-temperature ovens to universal testing machines will be shown.

## Parts Makers' Position Strong Despite Industry Integration

Addressing the annual meeting of the Automotive Parts Manufacturers' Association in Detroit last month, Frank Rising (APMA general manager) released a preliminary report on an economic study of the parts industry. Taking into account the highly competitive nature of the industry and the trend on the part of the larger vehicle producers to make more of their own parts, the study stresses the advantages of long-term continuity of relations between the major parts companies and their big customers.

It is estimated that about 80 per cent of the parts business is held by some 400 leading companies. Another group of some 2000 smaller specialists are producing many of the simpler components for other parts makers and for vehicle manufacturers.

The parts makers produce about \$3-billion worth of parts annually for their major customers. Some \$2-billion of replacement parts are also

turned out, it is calculated.

Approximately 400,000 factory workers are employed in the parts industry. Although about 70 per cent of manufacturing is housed within a radius of 300 miles from Detroit, there is a growing tendency to decentralize, and more than 30 states now have parts manufacture in their boundaries.

The parts companies are now larger, more diversified both in products and facilities, and are devoting more money to research and expansion. It is estimated that some 18 per cent of the volume is represented by Government orders.

The report, as mentioned previously, takes into account the fact that there has been a considerable expansion by the vehicle producers of their own parts-making facilities. However, it points out that, as of January, 1956, although General Motors was turning out 49 per cent of its own parts, it was still buying 51 per cent on the outside.

By the same token, Ford was producing 41 per cent of its own parts, but purchasing 59 per cent on the outside, while the percentages for Chrysler were 35 and 65, respectively. The independents, on the other hand, were making only 30 per cent of their own parts and buying 70 per cent from outside suppliers. The foregoing figures do not include tires, body shells, raw materials, and certain accessories.

(Turn to page 150, please)

## APPROACH OF SPRING BOOSTS FEBRUARY SALES SLIGHTLY OVER JANUARY FIGURES

### Regional Sales of New Passenger Cars

Zone	Region	February 1956	January 1956	February 1955	Two Months		Feb. over January	Feb. over Feb. 1955	Two Months 1956 over 1955
					1956	1955			
1	New England	26,115	22,134	24,382	48,249	46,885	+17.99	+7.24	-3.30
2	Middle Atlantic	70,644	59,963	81,371	130,507	161,279	+16.01	-13.19	-19.08
3	South Atlantic	58,363	62,246	63,091	120,609	124,962	-8.24	-9.37	-3.50
4	East North Central	115,665	115,104	124,907	230,769	234,632	+4.99	-7.40	-1.85
5	East South Central	25,350	21,109	24,679	46,959	46,656	+22.46	+4.74	+ .65
6	West North Central	41,179	37,246	42,305	78,425	83,269	+10.56	-2.66	-5.82
7	West South Central	46,786	39,600	44,190	88,385	81,126	+23.19	+10.40	+8.95
8	Mountain	14,383	13,558	14,954	27,951	26,165	+6.16	+3.15	+6.83
9	Pacific	46,848	60,788	57,135	107,336	108,274	-23.43	-18.53	-.87
Total—United States		447,542	431,646	476,584	879,190	916,273	+3.68	-6.09	-4.05

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn.

Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.



# FIRST and FOREMOST!

## AC "Standardized Dust"



primitively mined in Arizona




precision-processed in  
AC laboratories in Flint!

Early in 1942, a group of AC engineers, at the request of the U.S. Army, began a search for some sort of standard test dust to check efficiency of air cleaners. Many different kinds were checked until finally a particular kind of dust found only on the Pima Indian Reservation in Arizona was selected. Then, the engineers determined the percent of size of the grit for coarse and fine dust and set up processing procedures necessary to assure absolute uniformity. Standards were established for testing air cleaners, oil filters, gas strainers and other applications. The test dust and testing procedures were formally accepted by the Army Ordnance Department and U.S. Bureau of Standards.

Today, AC is the only American company mining, processing and marketing standard test dust. This is one more typical example of the leadership in research which keeps AC first and foremost in its field!



AC SPARK PLUG   
THE ELECTRONICS DIVISION OF GENERAL MOTORS  
FLINT—1300 North Dort Highway • CHICAGO—Insurance Center Building  
DETROIT—General Motors Building

**For More Than 20 Years Nearly Every Make of Car Has Used One or More AC Products**

ADAPTERS (DRIVE) • AIR CLEANERS • AIR CLEANERS AND SILENCERS (COMBINATION) • AMMETERS • BREATHERS (CRANKCASE) • CAPS (RADIATOR PRESSURE) • FLEXIBLE SHAFT ASSEMBLIES • FUEL PUMPS • FUEL AND VACUUM BOOSTER PUMPS (COMBINATION) • FUEL FILTERS & STRAINERS • GASOLINE STRAINERS • GAUGES—AIR (PRESSURE) • GAUGES—GASOLINE • GAUGES—OIL (PRESSURE) • GAUGES—TEMPERATURE (WATER, OIL) • OIL FILTERS (LUBE) • PANELS (INSTRUMENT) • RECIPROCATING VACUUM PUMPS • ROTARY VACUUM PUMPS • SPARK PLUGS • SPEEDOMETERS • TACHOMETERS • TERMINALS (IGNITION WIRE) • VALVES (CRANKCASE VENTILATION)

# AIR BRIEFS



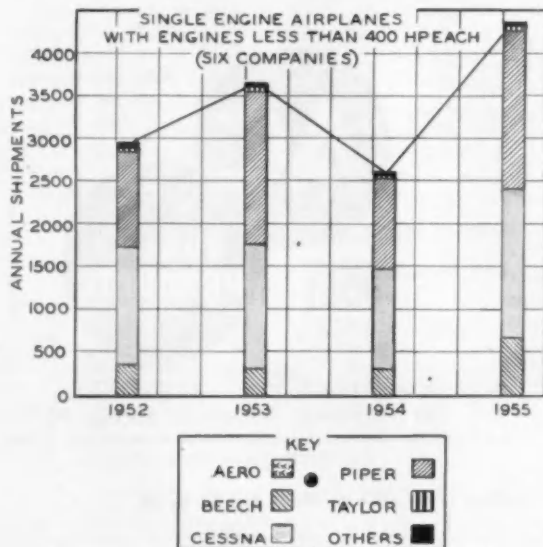
By RALPH H. McCLARREN

## UTILITY AIRCRAFT SHIPMENTS CLIMB

Year	Shipments of Single Engine Airplanes*	Shipments of Twin Engine Airplanes*
1955	4348	722
1954	2602	297
1953	3656	72
1952	2954	40

\*—with engines less than 400 hp each.  
Source: Peter Altman (Aircraft Industries Assn. data).

During the past two years, shipments of twin-engined airplanes with engines of less than 400 hp each have increased substantially. Of a total of 808 twin-engined aircraft (four to nine seats) delivered in 1955, there were 722 with engines of less than 400 hp each, all of the horizontal opposed cylinder type. The increase in shipments over 1954 was 143 per cent. These airplanes are in the price range from \$35,000 to \$125,000.



## Supersonic Fighter Unveiled

Last month the Air Force took the wraps off the Lockheed F-104A Starfighter. Described as the world's fastest combat plane, it is scheduled for quantity delivery within the next few months. The relatively light (14,000 lb) fighter can go 1320 mph.

The plane is almost 55 ft long, with short stubby wings only 22 ft across. Pilot's cockpit is far out front in the needle shaped nose. It is powered with a General Electric J79 turbojet engine with afterburner. Special air scoops on each side of the body (fuselage) are designed to prevent blockage of air, which would otherwise occur at such high speeds.

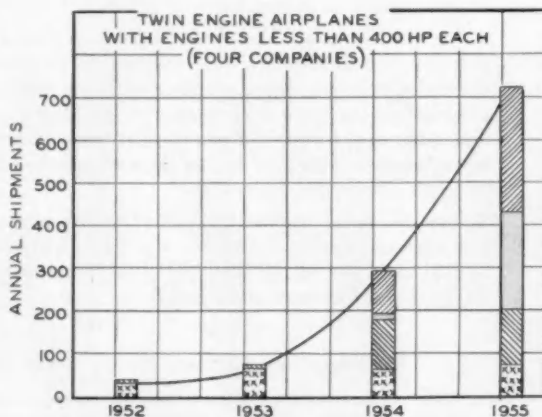
Lockheed Aircraft Corp. of Burbank, Calif. builder of the F-104A, has developed a two-seat version for training of pilots.

## F-102A Uses Heavy Press Forgings

Convair Div. of General Dynamics Corp. is now making heavy-press wing spars and fuselage bulkheads for the F-102A all-weather jet interceptor. The wing spars, designed specifically to be made on the Air Force's 35,000 to 50,000 ton heavy presses, are at least 100 lb lighter than similar built-up riveted spars and require 273 fewer parts.

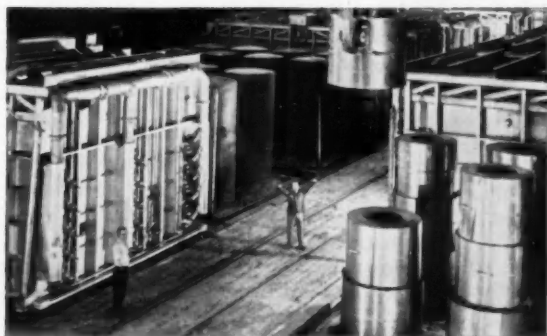
Similar savings are realized from the bulkhead frames made in the heavy presses. Convair is presently using eight parts from heavy press dies

(Turn to page 158, please)

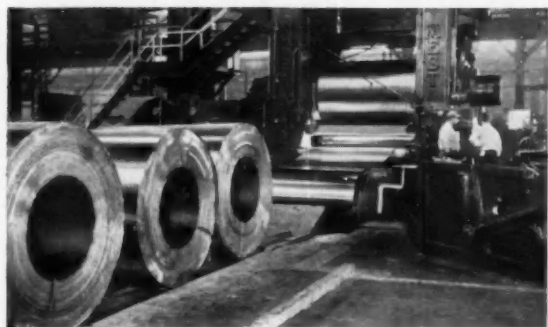




## How Great Lakes Steel *puts the pressure* on quality



COILS ARE ANNEALED in these giant ovens to impart maximum softness and ductility. And then . . .



COILS ARE TEMPER ROLLED in a skin mill to give the stiffness, surface and flatness which have been specified by the customer for the order.

Right on the nose—not too hard, not too soft! This steel coil passes the Rockwell Test with tolerance to spare.

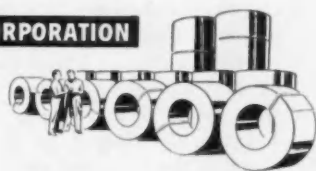
In the Rockwell, or hardness test, pressure is put on a sample piece of coil by a system of loads applied through a tiny ball. A needle gauge signals the depth of the impression. From this, our test engineers can readily tell: (1) if the coil was annealed to maximum softness for extra-deep drawing; and (2) if it is now properly tempered to meet customer specifications.

Quality control every step of the way—yes, that's our most important job at Great Lakes. Reason enough to call us and talk over your steel needs?

### GREAT LAKES STEEL CORPORATION

Ecorse, Detroit 29, Michigan • A Unit of

**NATIONAL STEEL CORPORATION**



*District Sales Offices:* Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

# The BUSINESS PULSE

*Higher Discount Rates Viewed as Anti-Inflationary Step. Present Prospect Seems to Be for Moderate Continuing Expansion in Governmental Spending and in Plant and Equipment Outlay. Retail Trade Remains Virtually Unchanged.*

This Survey Is Prepared  
Exclusively for AUTOMOTIVE  
INDUSTRIES by the Guaranty  
Trust Company of New York.

## No Threat of Recession

The outstanding business development in April was the Federal Reserve's action in advancing discount rates for the fifth time within a year. In New York and most other Reserve centers the increase was from  $2\frac{1}{2}$  to  $2\frac{3}{4}$  per cent; in Minneapolis and San Francisco it was from  $2\frac{1}{2}$  to 3 per cent.

This step was of exceptional interest, because it came after an interval of five months during which the economic weather signs had been strangely mixed and the Federal Reserve had given little indication of its attitudes. What it revealed was that inflation, not recession, continued to be the main threat to economic stability, in the judgment of Federal Reserve officials.

While official explanations of rate changes are never given, one does not have to seek far to uncover possible reasons for the action. The most obvious target for the restrictive action was the phenomenal rise which had been occurring in bank loans to business so far this year. Normally such loans decline in the early months of each calendar year; but in 1956 there has been an expansion exceeding even that which took place in the comparable period of 1955, when the boom was getting up a full head of steam. Borrowing was particularly heavy this year around the March 15 tax date, with the total of commercial, industrial and agricultural loans of weekly reporting member banks of the Federal Reserve System jumping by nearly \$1½ billion in the four weeks ending March 28.

This loan expansion is particularly questionable because it has occurred at a time when the economy has been operating at virtually full capacity. The increase has therefore posed an inflationary threat, because there is the very real possibility that businessmen in spending the proceeds of these loans will merely bid up prices instead of evoking a larger flow of materials.

Indeed, there have been noticeable pockets of inflationary pressure in the economy for the past half year or so. The wholesale price index of the Bureau of Labor Statistics, which showed nothing more than a sideways drift from the latter part of 1952 through the first half of 1955, has lately been rising. In the four months ending at mid-April, it showed a rise of about two per cent, which in so short a time is a rather sharp increase for an index so broadly based. Apparently, the objective of the Federal Reserve in making its latest increase in discount rates was to nip this incipient inflation in the bud by trying to discourage marginal borrowers.

## Mixed Patterns

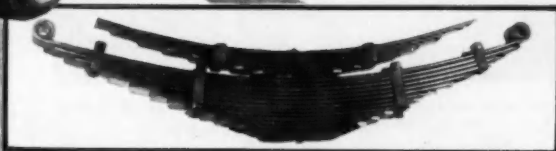
Cogent as these reasons may seem, there is no unanimity of opinion regarding the wisdom of the rate advance at this time. Some people, while acknowledging the existence of the specific inflationary pressures cited above, emphasize the fact that there are also depressive influences at work in the economy at present. Whereas the Reserve authorities apparently believe that the inflationary tendencies are at least slightly in the preponderance, others are not so sure. Indeed, there have been rumors that certain Administration officials, including the Secretary of the Treasury and the chairman of the President's Council of Economic Advisers, took a stand against the latest rise in the discount rate.

Those who are uncertain as to the wisdom of the Federal Reserve action cite as the principal cause of their doubt the continuing rather static pattern of general economic activity. They note that for the last six or seven months business has scarcely done anything more than move in a sideways direction. The Federal Reserve's seasonally adjusted index of industrial production, having declined by one point from February to March, was at exactly the same level in the latter month as it was in September of last year. Similarly, retail trade on a seasonally adjusted basis has remained unchanged for all practical purposes since the end of last summer. Certainly, it is difficult to find any sign of overexpansion in these areas.

*(Turn to page 144, please)*



# Equal to the toughest Task....!



**D**ODGE "Job-Rated" trucks, in their wide range of models and capacities, meet 98% of all hauling and delivery needs . . . from the half-ton pick-up to powerful machines rated up to 60,000 pounds gross.

Here, Burton Springs have proven equal to the toughest task . . . passing every critical test, not only on the proving ground but in actual service. Enduring extreme conditions of high speed, rough roads and heavy loading, Burton springs consistently satisfy the most exacting requirements of the industry.

Whatever your spring specifications are, it will pay you to take advantage of Burton's experience in this specialized field.

## BURTON

**AUTO SPRING CORP.**

. . . Vital Support for the Automotive Industry . . .

WESTERN AVENUE AT FORTY-EIGHTH STREET

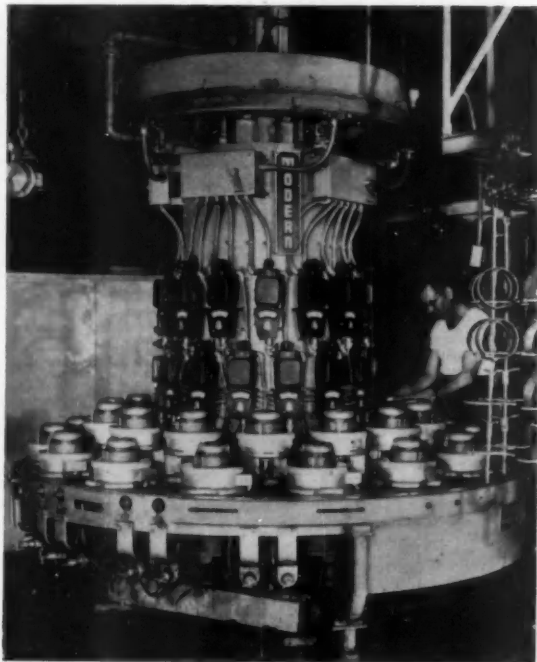
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CHICAGO 32, ILLINOIS

# Automatic Transmission Bands

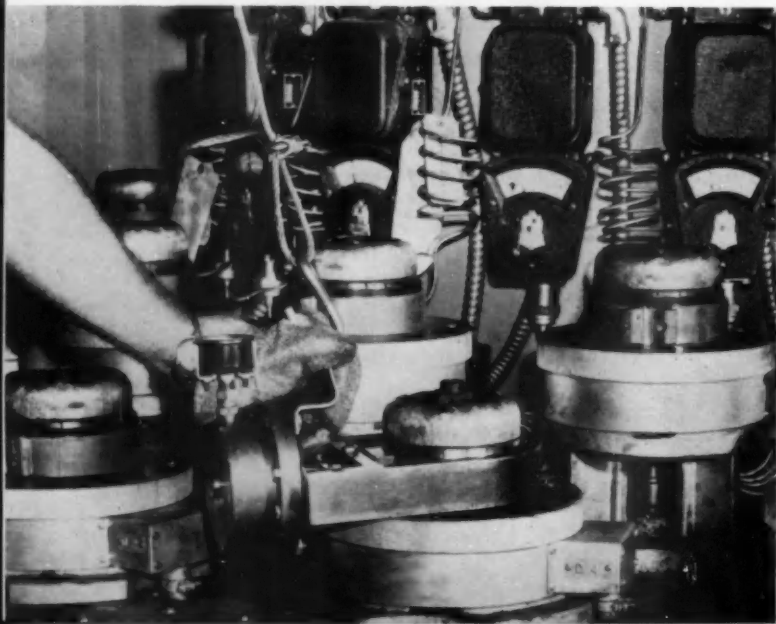
*Bonded on*

## 30-Station Machine



Operator shown loading transmission brake band assembly on 30-station rotating machine

Closeup of bonding fixture and gaging unit used to set pressure of individual stations



**H**IGH output of bonded automatic transmission bands is realized at the Muncie, Indiana, plant of Warner Gear Division, Borg-Warner Corp. using a single "merry-go-round" machine. Operation throughout the entire bonding cycle is fully automatic with the operator only having to load and unload parts.

The 30-station rotating machine used was designed and built by Modern Industrial Engineering Co., to handle two thicknesses of transmission brake bands. Time cycles as well as mandrel pressure and temperatures can be varied depending on the thickness of the metal band on the part being bonded.

In bonding the transmission brake band with the thicker metal band, a part makes the complete cycle in 10 minutes giving a production rate of 180 per hour. The parts with the thinner bands take 7½ minutes for a complete cycle with output totaling 240 parts per hour.

Machine uses regular plant air supply at 90 psi for clamping parts during the bonding operation. An air regulator valve is provided for each station to control uniformity of the pressure and each station also has its individual adjustable temperature control.

In the event that trouble develops at any station the machine does not have to be shut down so that necessary repairs can be made. Five control panels are provided, each handling six work stations. In this way a group of six stations can be taken out of service for repairs or maintenance while the other 24 stations are kept in production without interruption.

Adhesive coated molded brake band linings are placed into the metal bands for bonding and put on the segmented mandrel by the operator at the start of the cycle. Air pressure applied through a cylinder at each work station forces jaws apart holding the lining to the metal band under heat and pressure. As the machine rotates, a cam on the outer periphery of the machine releases the pressure temporarily allowing gases to escape and insuring a complete bond. At the completion of the cam travel the pressure is reapplied for the remainder of the bonding operation.

For curing the part with the thicker band, 185-200 psi pressure at 435-450 F is applied for 10 minutes. The thinner band requires 125-135 psi at 400-415 F.

Pressures at each work station are set by means of a gaging unit built by Modern Industrial. The fixture is lowered over the mandrel and the pressure is set with the valve for the particular work station. Power for machine rotation and the heating elements is supplied at 220 volts through a power rail located at the top of the machine.

# HOW A YOUNG METHODS ENGINEER USED KEPS® TO SPEED THE LINE!

## TIME RECORD SHEET

Backlog getting bigger... how do we speed our production??

Assembly people are having trouble with lock washers and nuts... Keep dropping 'em or "forgetting" 'em



**SAY!** What about KEPS?  
Nut and lock washer are pre-assembled mechanically before they reach the line!



The lock washer can't drop off but rotates freely



The **SHAKEPROOF**® Lock Washer has powerful twisted teeth that bite deep, give positive locking action



Vibration will **NEVER** work KEPS loose!



**KEPS**... Save time, improve product quality and cut costs!

# SHAKEPROOF

"Fastening Headquarters"®

St. Charles Road, Elgin Illinois • Offices in Principal Cities  
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SEND FOR FREE  
"SHAKEPROOF SAMPLER"  
... contains Keps samples and helpful assembly suggestions.

**SHAKEPROOF  
FASTEX**

**DIVISIONS OF ILLINOIS TOOL WORKS**  
World's Broadest Line of Mass-Assembly Fastenings

**A**RGENTINA'S recent order for a number of Czechoslovak light planes underlines the development of the aircraft industry in that country and the build-up of its export potential. Several basic models are now being made there. Newest is the L-60, designed especially for agricultural work. This high-wing, all-metal monoplane cruises at 110 mph and has a minimum speed of 30 mph. It needs a 400-ft take-off run and can land in 250 ft. Climbing time to 3250 ft is 4½ min, and maximum ceiling is stated to be 17,000 ft.

The flat-6, aircooled engine designated at the Praga Doris B is rated at 220 hp. Span is 46 ft, length 27.8 ft, and wing area 259 sq ft. Weight is 2130 lb and load capacity 980 lb. The clear plastic cabin seats four people and gives good all-round visibility. Fitted for crop spraying or dusting, the L-6 carries a 92-gallon tank for chemicals. With a range of 420 miles, it is stated to be suited also for observation, ambulance and taxi work. Mass production starts this year.

Closest to a business-aircraft is the twin-engined Aero 45, with cabin accommodation for 4-5 persons. This low-wing metal craft uses a pair of Walter Minor 4-III engines each developing 105 hp at 2500 rpm. These four-cylinder in-line units are of the inverted type and are air-cooled. They include electric starters and variable-pitch propellers.

Top speed is 170 mph and the maximum range of 510 miles can be extended to 900 miles with auxiliary fuel tanks. Climb rate is said to be 980 fpm, and a 625-ft run is required for landing and take-off. Landing speed is given as 40 mph, and retractable gear is hydraulically operated.

The same 105 hp unit powers Czechoslovakia's single-engined Z-126 trainer. This low-wing two-seater flies at 120 mph using 37 lb of gasoline per hour.



Designed mainly for crop dusting, the L-60 can fly at 30 mph. The four-place cabin is made of clear plastic.

## Czechoslovak Light Aircraft

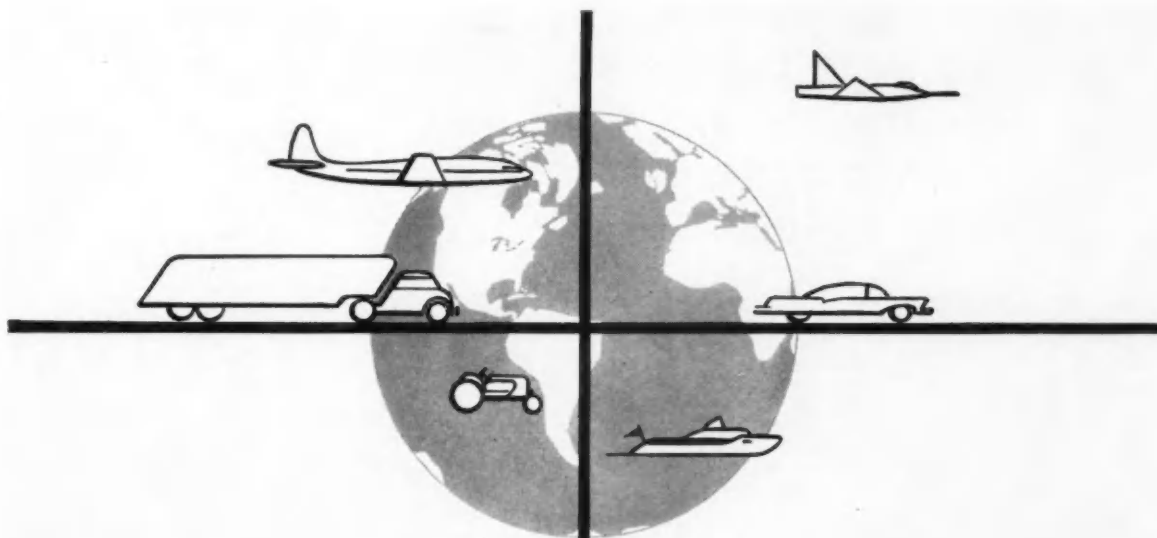


Z-126 trainer. The inverted four-cylinder in-line engine develops 105 hp at 2500 rpm.

*Twin-engined Aero 45 has a top speed of 170 mph. Maximum range with auxiliary tanks is 900 miles.*







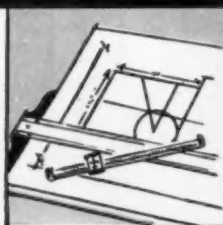
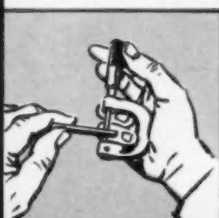
# AUTO-LITE Serves Industry

with more than 400 products of the highest quality

SCIENTIFIC RESEARCH



PRECISION MANUFACTURING



CREATIVE ENGINEERING



WORLD-WIDE SERVICE

Whether it be intricate die-castings, finely drawn magnet wire, electrical equipment for the automotive industry or any one of hundreds of other products . . . it is of the highest quality when it comes from Auto-Lite. This reputation for quality in 28 plants from Coast to Coast is maintained through central engineering control and is reflected in the public acceptance of the name Auto-Lite . . . and in the world-wide establishment of Auto-Lite service facilities.

**THE ELECTRIC AUTO-LITE COMPANY**  
TOLEDO 1, OHIO



## LET'S TALK FACTS ABOUT YOUR HOSE ASSEMBLIES

—facts that mean  
performance to you



I'm sure we can agree that there is as much difference in hose assemblies as night and day — that is, in dependable PERFORMANCE. That's where I would like to help you and save you money. "Anchor" on your Hose Assemblies is certification of a "know-how" that has become a specification with many of the leaders in the automotive field. This experience in design, production and application assures you the proper hose quality and coupling style to scientifically meet your requirements with a maximum service life. This "know-how" is your protection if you will consult with Anchor on all of your needs for Power Steering, Freon and Hydraulic Hose Assemblies, Couplings and Automotive Fittings — you will be pleasantly surprised with the results.

### Meanwhile —

let me send you available literature on the standard Anchor Hose Assemblies, Couplings and Fittings applicable to your needs.

**Power Steering Assemblies —**  
are designed and produced to your specifications, but are briefly covered in Catalog No. 600.

**Freon Assemblies —**  
Catalog No. 600.

**Automotive Fittings —**  
Catalog No. 600.

**Hydraulic (pressed-on and reusable)**  
couplings and assemblies

Catalog No's. 100, 301 and 400.

Send me the specification on your current requirements for recommendation.

*Andy Anchor*

See us in Booth No. 207  
at the June M.H.I. Exposition  
Cleveland



**ANCHOR COUPLING CO. INC.**

360 North Fourth Street Libertyville, Illinois  
Branch Offices: Dallas, Tex.; Plymouth, Mich.

## MACHINERY NEWS

(Continued from page 79)

### Fire Resistant Fluids

As promised at the Vickers conference on machinery hydraulics last year, the company has finished a very interesting bulletin on the use of fire-resistant fluids in industrial hydraulic systems. It covers the subject from basic considerations in changing over from petroleum base fluids through the complete range of fire-resistant fluids. This should be a must on the reading list of all production men.

## BOOKS ...

**ASTM STANDARDS ON PETROLEUM PRODUCTS AND LUBRICANTS**, published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$6.50. The 1955 edition of this compilation, which is issued annually, contains 159 standards, 41 of which are new or have been revised since the previous edition. Included are two new tentative methods of test for the lubricating qualities of graphite and for trace concentrations of tetraethyllead in primary reference fuels. New standard methods of test are given for aromatic hydrocarbons in olefin-free gasoline, oxygen in butadiene vapors, effect of grease on copper, lead in new and used greases, sampling liquefied petroleum gases, unsaturated light hydrocarbons, etc. Included also as information only are 12 proposed methods of test which have not been formally approved by the ASTM.

**THERMAL POWER FROM NUCLEAR REACTORS**, by A. S. Thompson and O. E. Rodgers, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price \$7.25. Intended primarily for the mechanical engineer, this book stresses a design approach to the problem of developing atomic reactors. The application of engineering problem-solving techniques, such as numerical and dimensional analysis, are discussed and workable design criteria are formulated. Also discussed are such problems of reactor development as thermal stresses, transient behavior of reactors, and distribution of gamma rays and neutrons. To orient the engineer to the current thinking of physicists, the authors have written an introduction which gives a concise review of nuclear fission and a general description of nuclear reactors.

**SPECIFICATIONS AND TESTS FOR ELECTRODEPOSITED METALLIC COATINGS**, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$1.85. This compilation of 17 specifications, methods of test, and recommended practices embodies the work of ASTM Committee B-8 on metallic coatings. Included are the specifications for zinc, cadmium, nickel-chromium, and lead on steel; nickel-chromium on copper; nickel-chromium on zinc; and chromate finishes on zinc coatings. In addition, there are recommended practices for preparation of low-carbon steel, high-carbon steel, zinc-base die castings, and copper-base alloys for electroplating; chromium plating on steels; and preparation of and electroplating on stainless steel and aluminum alloys.

*if suddenly*

your products  
begin to  
test more  
faithfully to  
design . . .

If your production  
line is running  
more smoothly . . .

If "identical"  
installations  
stop showing  
varied results . . .

If rejects drop . . .  
or stop . . .

*then maybe*

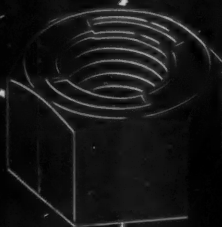
some intelligent  
person in your  
design, engineering,  
purchasing or  
production  
department  
has been specifying

**THE LOCK NUT  
THAT ENABLES YOU TO  
PREDICT...AND  
MAINTAIN**

**M.F.**

**LOCK NUT**

Also a complete line of semi-  
finished hexagon nuts in all series.  
For immediate quotation and deliv-  
ery, phone EDgewater 4-8420.

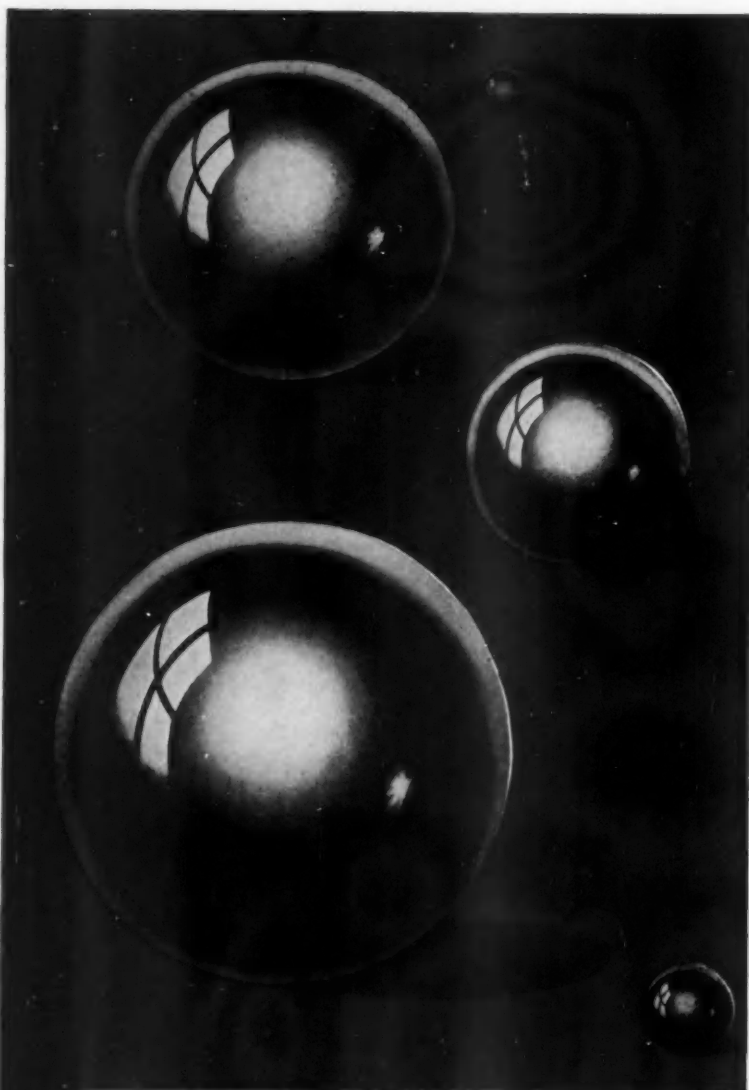


**UNIFORM  
BOLT  
TENSION**

**MACLEAN-FOGG**  
*Lock Nut Company*

5535 N. Wolcott Street, Chicago 40, Illinois

IN CANADA: The Holden Co., Ltd., Montreal



# COOLIDGE *Balls*

CHROME ALLOY AND STAINLESS

COOLIDGE CORPORATION  
MIDDLETOWN, OHIO

## AI TABLOID AI

(Continued from page 37)

Fordson Major Diesel tractor is now available in two tricycle models.

\* \* \*

Dreis & Krump Mfg. Co. has set up a new display and demonstration room at the plant at 7400 S. Loomis Blvd., Chicago, Ill.

\* \* \*

Electric Auto-Lite Co. is considering plans for a new office building in Toledo, O.

\* \* \*

Crucible Steel Co. of America has formed a new division for the fabrication and sale of steel springs. . . . Bell Aircraft Corp. has formed a Nuclear Engineering Dept.

\* \* \*

Minneapolis-Honeywell Regulator Co. plans to establish its expanding Transistor Div. in a new location in the Boston area.

\* \* \*

Champion Spark Plug Co. has adopted a new electrode alloy called Powerfire for use in its automotive-type spark plugs.

\* \* \*

Aero-Coupling Corp. has opened a plant to provide facilities for forming, brazing, and welding tubular components for aircraft.

\* \* \*

Utica Div. of Bendix Aviation Corp. has undertaken a sizable engineering expansion program.

\* \* \*

Air Force and Glenn L. Martin Co. have announced production and successful first flights of the RB-57D and the B-57E. They are two new versions of the basic B-57 light bomber.

\* \* \*

Aluminum Co. of America will build a \$45 million plant at Point Comfort, Tex., for the production of alumina.

\* \* \*

Hanson - Van Winkle - Munting Co., Inc., has developed a new bright nickel plating process called Levelume.

(Turn to page 134, please)



# Sigma Welded Aluminum Tanks



—WEIGH LESS  
—CARRY MORE  
—LAST LONGER

The problem of how to get bigger pay-loads in truck trailers and semi-trailers was solved by one manufacturer who converted to weight-saving aluminum and sigma welding . . . These giant semi-trailer tanks hold 7,950 gal.—700 gal. more than similar tanks made of steel.

The high quality of sigma welded aluminum has increased tank resistance to corrosion. Sigma welding has also eliminated expensive weld cleaning—welds need only a light grinding and they are finished. Each semi-trailer requires about 1,100 linear ft. of sound sigma welding. The new high-strength, ductile alloys used range in thickness from 3/32 to 1/2 inch.

Like many other products throughout industry, these trailers are being fabricated with new quality and efficiency using sigma welding.



## Here are some features of sigma welding—

- Uses any d.c. or constant potential power supply. With c.p. voltage is held constant—welding operations are fast and more efficient.
- Makes smooth welds in joints of all types—on all commercially welded metals . . . joins metals up to 1/4 in. thick in one pass.
- Sigma welding speeds exceed 100 in. per min. in many operations. Start saving now, call your local LINDE representative for more information—and ask for Form 7942 "Modern Methods of Joining Metals."

## Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street **UCC** New York 17, N. Y.  
Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY  
Division of Union Carbide Canada Limited, Toronto  
(formerly Dominion Oxygen Company)

The term "Linde" is a registered trade-mark of  
Union Carbide and Carbon Corporation.





To get clean wipers at the tool crib, this lathe operator must make the hike, then stand in line. Dirty wipers in hand, he makes the trip at least once a day, takes several minutes to do it.

## He has to waste 60 minutes a week



In two sizes

Easy to distribute



Really soak up oil ...



Always a clean one handy ...



Just toss 'em in the trash ...



With a carton of 125 clean Scott Wipers at every workbench, daily wiper replacement is often unnecessary. One carton can last for days and a man has a fresh supply right at his fingertips.

## ... He stays on the job The difference is... Scott Wipers

Check your production line. See how much time the men are forced to waste in order to keep supplied with fresh wiping material.

It adds up to more lost production time than you might think.

Scott Wipers are disposable. A man picks up a carton when he checks in... keeps it with him all day long. He uses one Wiper thoroughly—throws it away. Compli-

cated distribution is ended. So is sorting, baling, and laundering.

And with fresh Scott Wipers there's no danger of hidden chips damaging men or metal.

Your local Scott representative or distributor will demonstrate the Scott Wiper in your plant. Call him or mail this coupon today.

*Another quality product of...*

**SCOTT PAPER COMPANY**

Scott Paper Company  
Dept. W-3, Chester, Pa.

Please send me more  
information about  
Scott Wipers.

Name \_\_\_\_\_

Company \_\_\_\_\_

Position \_\_\_\_\_

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## Get cleaner, brighter ALUMINUM... Safer, tighter welds



1. Clean it with PENNSALT CLEANER A-27
2. Deoxidize it with PENNSALT ALDOX!

To prepare aluminum parts most thoroughly for spot welding, etching, or chemical treatment, take advantage of this great Pennsalt cleaner-deoxidizer team—A-27 and ALDOX. The smut-free, bright aluminum surface you get with these Pennsalt chemicals retains its low surface contact resistance under normal conditions for one to four weeks.

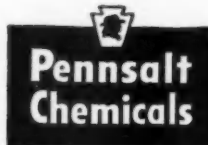
### LOOK AT THE COMPONENTS . . .

CLEANER A-27 is a non-etching inhibited alkaline cleaner that won't stain the metal when properly used, even when allowed to dry before rinsing. Toughest shop grimes and marking inks come clean easily in A-27; hard water won't retard its easy dissolving and free rinsing.

ALDOX® is a balanced deoxidant, far easier to handle and much more economical than nitric acid for the desmutting bath. Do away with acid carboys and handling hazards by switching to ALDOX.

### . . . THEN SEE THEM WORK FOR YOU

Ask your Pennsalt representative for a demonstration of A-27 and ALDOX on your most stubborn aluminum deoxidizing job, or write Metal Processing Dept. 229, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: Woolsey Bldg., 2168 Shattuck Ave., Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.



Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

A B E T T E R S T A R T F O R Y O U R F I N I S H





**Mr. Motorist:**

**why are the wheel  
covers on your car  
made of**

**stainless  
steel?**

Because nothing less than true stainless steel gives you the beauty that smiles at exposure . . . the strength that shrugs off years of highway hazards! Down where the going is roughest, stainless wheel covers stay bright and unblemished despite destructive road chemicals, flying grit, cinders and gravel—*proving the point* that for every automotive application where timeproof, carefree brilliance is desired, stainless steel is the metal of choice. Look for it, everywhere!

**SUPERIOR STAINLESS STRIP STEEL**



**Superior Steel**

CORPORATION

CARNEGIE, PENNSYLVANIA

# MORE EFFICIENT DESIGN, IMPORTANT SAVINGS, SIMPLIFIED ASSEMBLY, BETTER APPEARANCE

These are some of the many benefits reported by Design Engineers who have adopted TRU-LAY PUSH-PULLS for remote control operations on literally hundreds of products

**Here are typical comments** recently received from equipment manufacturers whose machines or implements are equipped with these accurate and dependable remote controls:

## **Saves Time, Labor and Material**

"The use of your flexible Push-Pulls saves us a great deal of time, labor and material. The old linkages frequently required much planning in both engineering and shop which is not required now. On some of our equipment we use Push-Pulls from 10 to 30 feet in length. They operate clutch controls on the Main Power Unit, Feed Conveyors and Delivery Conveyors."

## **Greater Flexibility of Design**

"The principal advantage of Tru-Lay Push-Pulls in our application is that they permit flexibility in locating the control valve in relation to the operator's position."

## **Cost Less to Install**

"Tru-Lay Push-Pulls are easier and less expensive to install than linkages for remote control of power take-off,

brake and clutch. Better appearance, too."

## **Simple and Neat**

"For several models of farm tractors, we selected your controls for their simplicity and neatness of application as governor controls."

## **Solution to Tough Problem**

"Can be installed where straight rods are impossible... for Remote Control of transmissions, brakes and clutches."

## **Eliminates Maintenance**

"Simple operation and elimination of maintenance problem are the major advantages in using your Push-Pulls."

## **Reduces Number of Parts**

"Your Push-Pulls have eliminated links, radius rods and other lost-motion devices for remote control of hydraulic valves."

## **Provide ACCURATE Control**

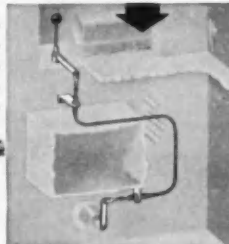
"Tru-Lay Push-Pull control cables provide minimum back-lash, even in installations up to 30 feet in length, because the cable is designed to close tolerances with minimum drag and lost motion."

**TRU-LAY PUSH-PULLS** are "Solid as a rod but Flexible as a wire rope." This flexibility makes it possible to snake around obstructions... permits the ideal arrangement of all elements of remote controls.

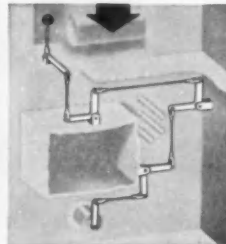
**Advantages of Tru-Lay Push-Pull flexibility and simplicity are pictured below—**

### **TRU-LAY PUSH-PULL**

Simple  
One Moving Part  
Life-Time Service  
Life-Time Accuracy  
Low over-all Cost  
Noiseless



### **MECHANICAL LINKAGES**



Complex  
Many Parts  
Many Points of Wear  
Increasing Back-Lash  
Loss of Accuracy  
Vibration  
Rattles

Construction Equipment and Farm Implements provide good examples of the wide-spread use of these accurate, simple and dependable Push-Pulls. On Power Shovels, Winches, Graders, Road Oilers, Dump Trucks, Snow Plows, Engine-driven Pumps, Crushers, Tractors, Combines, Corn Pickers, Corn Row Sprayers, Corn Detasslers, Orchard Sprayers, Power-driven Tree Trimmers, Tobacco Picking Machines and others...

TRU-LAY PUSH-PULLS are operating unflinching for the remote control of Hydraulic and Air Valves, Brakes, Clutches, Transmissions, Throttles, Chokes, Governors, Power Take-Offs, Spray Nozzles, Vent Directional Fins and on many other applications.

**ACCO**

Our DATA FILE will answer all further questions

**AUTOMOTIVE and AIRCRAFT DIVISION  
AMERICAN CHAIN & CABLE**



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2216-H South Garfield Ave., Los Angeles 22 • 929-H Connecticut Ave., Bridgeport 2, Conn.

## There is No Worry about Failures or Maintenance Costs with TRU-LAY Push-Pull Remote Controls

**Long Life** is a matter of record. We have never heard of a Tru-Lay Flexible Push-Pull Control wearing out in normal service. Failures, that sometimes harass users of more complex controls, are eliminated by the use of these simple, positive-action controls.

**Dependable Operation** of these controls is a certainty, even under the most adverse conditions... HOT as jet engines (note: Tru-Lay Push-Pulls are actually performing on hot jet applications)... COLD to 70° F below zero... SOAKIN' WET... ABRASIVE... or just plain TOUGH.

**Freedom from Trouble** is assured because of such features as... full protection of the inner, working member by the tough flexible conduit... lubrication of the inner, working member for life during assembly... seals that keep moisture, dust and other foreign matter out of the unit... cold swaging of fittings that makes them integral parts of the control unit.

**Accuracy** is inherent in the basic design of Tru-Lay Push-Pulls. They are precision products, not gadgets.

**Capacity** ranges from light jobs up to jobs of 1,000 lbs. input. These Push-Pulls will handle jobs 150 feet or more from the control point.

"Solid as a rod, Flexible as a wire rope" aptly describes Tru-Lay Push-Pull Controls. This flexibility provides positive, remote action whether anchorages are fixed or movable... it damps out noise and vibration... it greatly simplifies installation of controls by reducing the number of working parts and by making it possible to snake around obstructions.

**Adaptability** to all sorts of mechanical situations explains, in large measure, the wide-spread application of Tru-Lay Push-Pulls. Standard anchorages, fittings and heads have been designed that meet requirements on approximately 80% of the installations. Simple modifications of these standards, or minor changes in your own design, cover almost every special situation. Our engineers have the know-how on such matters, and will work with you.

**For Further Information**—The DATA FILE pictured at the left contains six booklets and bulletins that will answer any further questions you may have about this versatile and dependable tool. It is quite likely that this material will point the way to a simplified solution of your remote control design problems. Write for a copy.



# The Outlook for Plastic Car Parts

By William C. Wall

Polychemicals Dept.  
E. I. du Pont de Nemours & Co.

Plastics for strictly functional use received little serious consideration from car makers before World War II. The experience in the functional use of plastics during the war, when new compositions having vastly improved mechanical characteristics were successfully adapted to military equipment, sparked the tremendous postwar advance.

## Plastic Bodies

Perhaps the most spectacular development since the war has been the rapidly increasing use of reinforced plastics in automotive bodies and components. The idea of plastic bodies for automobiles is not a new one. In the mid-thirties, Henry Ford created a sensation with his soybean plastic body panels. Although plastics made from soybeans never progressed beyond the experimental stage, the basic idea was certainly sound.

Tooling costs for the production of a plastic body may be as little as one-fifth the tooling cost required for a comparable metal body. A single show car or a limited production car can be constructed of reinforced plastics in a much shorter time and at far less cost than is possible with metal-working techniques.

Reinforced plastic construction is also well suited for most large semi-trailers which are built on a custom basis. Tooling costs are held to a minimum, yet the designer has a great deal of freedom in meeting the needs of his client. Tanks for oil and chemical transport trailers, having capacities as large as 3400 gallons, have been constructed from reinforced plastics and have proven satisfactory in service. Operating experience has shown that these structures require little or no maintenance for extended periods, and that efficiency has improved significantly through the weight reduction resulting from the use of lighter materials.

As production volume is increased, however, tooling costs become less important with respect to unit manufacturing cost. With present techniques, unit manufacturing costs for complex structures of reinforced plastics are substantially higher than for corresponding metal structures; and, as a result, the economic advantages of low tooling costs are lost. Major im-

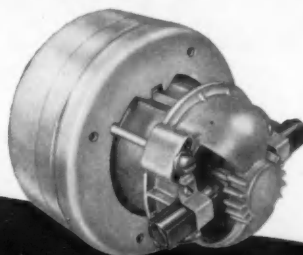
provements in the techniques for fabricating reinforced plastics must be made before we can expect to see all-plastic bodies on the family automobile. It has taken many years to develop the skills and techniques of metal fabrication employed on today's

assembly lines; equally efficient methods for the fabrication of reinforced plastics will have to be developed before the metal automobile body will become a thing of the past.

In less complex shapes, the cost picture for reinforced plastics is much more favorable. This year, Studebaker is effectively combining reinforced plastic components with metal to achieve a variety of "high style" effects at minimum cost. The folding top cover of the Cadillac Eldorado for 1956 is made of reinforced plastics, and it is designed for trunk storage

(Turn to page 116, please)

standard in its field  
the world over...



Turbine for  
canister-type  
vacuum  
cleaner.

Equal Quality Assured  
for YOUR  
Motor-Driven Products



Ruggedly constructed  
equipment motor.



Intermittent high torque  
aircraft motor.

The outstanding quality and performance of the Lamb Electric vacuum cleaner motor, shown above, result from proper design and careful manufacture, by personnel having years of experience in the small motor field.

High quality and controlled costs go hand-in-hand because our company is equipped and organized to custom manufacture on a volume basis.

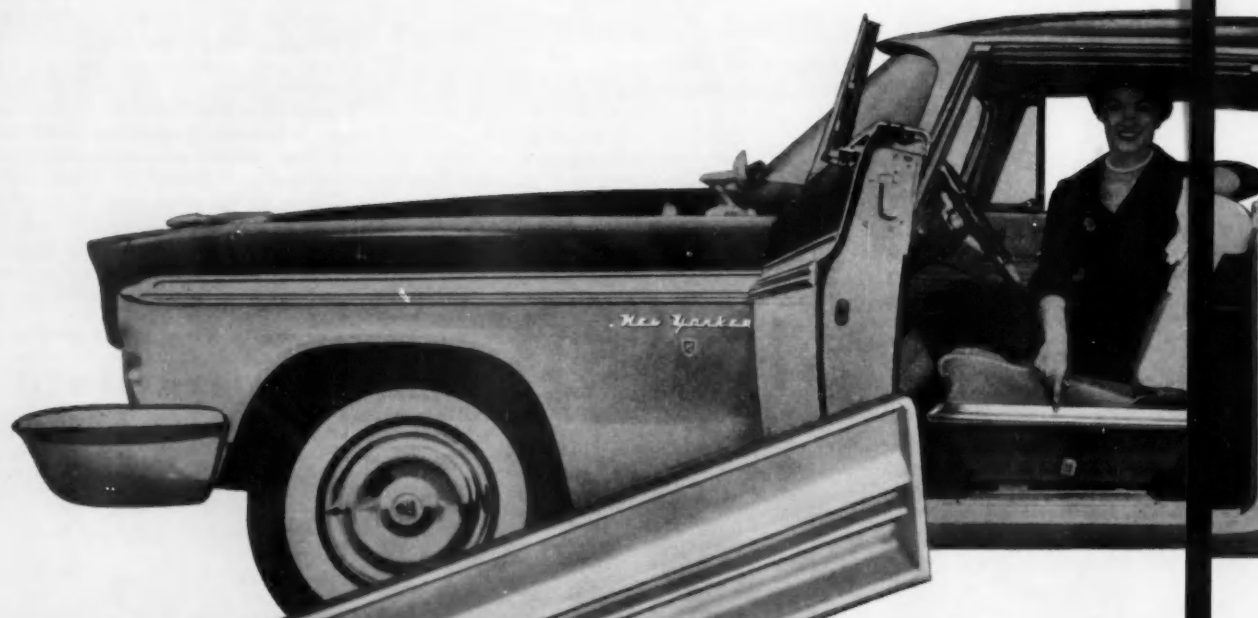
Ask us to demonstrate the benefits of Lamb Electric special application motors for your products.

THE LAMB ELECTRIC COMPANY  
KENT, OHIO

In Canada: Lamb Electric — Division of  
Sangamo Company Ltd. — Leaside, Ontario

*Lamb Electric*

SPECIAL APPLICATION  
FRACTIONAL HORSEPOWER MOTORS

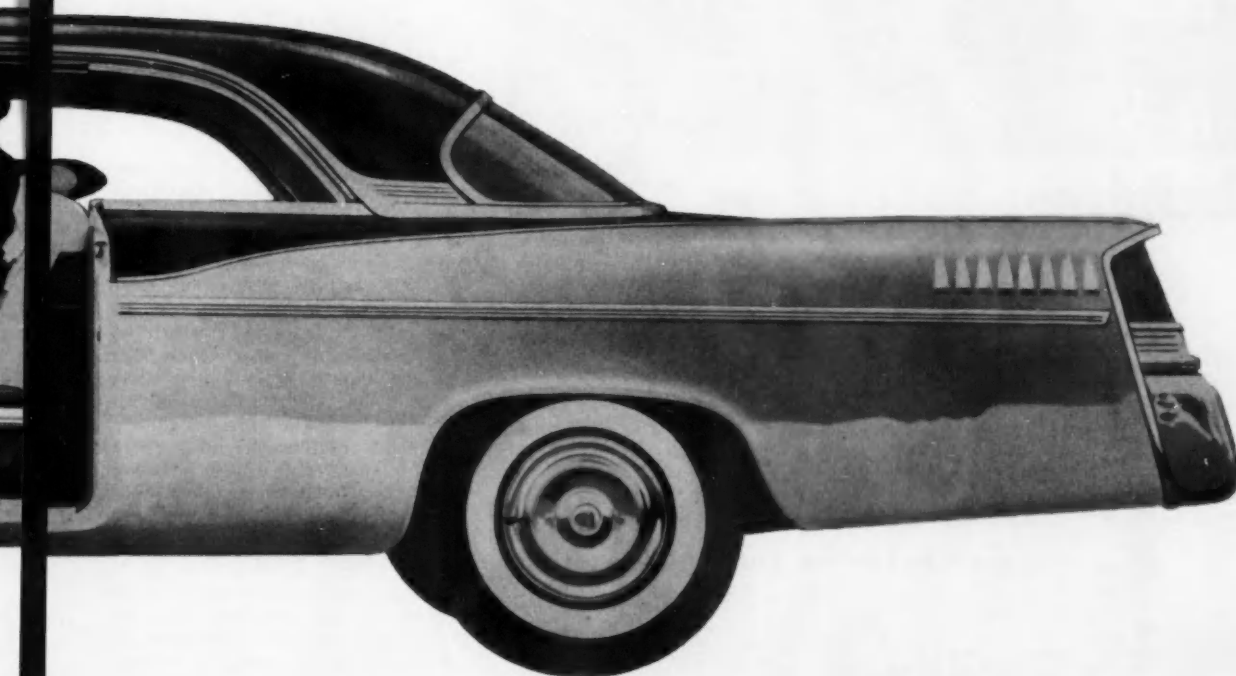


ALUMINUM EXTRUSIONS

ADD MORE BEAUTY TO

**"THE FORWARD  
LOOK"**





Chrysler Corp. engineers and stylists, always on the alert for new ways to improve design and reduce cost, recently changed seat moulding specifications on the Chrysler New Yorker and Imperial.

The new parts are beautiful, massive-appearing aluminum extrusions. Light Metals Co. of Grand Rapids is the supplier, using materials furnished by Kaiser Aluminum.

Aluminum extrusions were chosen over all other materials because of their beauty and economy.

#### BEAUTIFUL PARTS MADE POSSIBLE

Chrysler engineers found that the aluminum extrusion process made beautiful parts easy to produce. An extremely wide choice of graceful, decorative forms and shapes were made possible—and virtually any design created could be produced quickly, and at lower cost than was possible with any other method.

Beautiful satin finishes were easily achieved by etching and anodizing . . . making aluminum's natural beauty extremely resistant to corrosion and abrasion.

#### TOOLING COSTS NEGLIGIBLE

Aluminum extrusions *drastically reduced tooling costs!* Simple tooling, limited to the die and standard bending jigs, also made it possible to quickly establish multiple sources of supply.

Versatile aluminum is helping to improve automotive design and reduce cost in many ways. Improvements and substantial savings are being made in screw machine parts and structural and functional components, as well as in trim and molding sections.

*We are eager to work with you as an "idea partner."* Let our automotive development engineers examine the parts now being used in your production so that we may recommend improvements and savings you can effect by specifying aluminum.

★ ★ ★

For immediate service, call TRinity 3-8000, Kaiser Aluminum & Chemical Sales, Inc., 1414 Fisher Bldg., Detroit, Michigan; General Sales Office, Palmolive Bldg., Chicago 11, Ill.; Executive Office, Kaiser Bldg., Oakland 12, Calif.

# Kaiser Aluminum

# Which of These **OLSEN** Balancing Machines Is Best for You?

## ElecΦdyne



**Horizontal Static-Dynamic Balancing Machines.**

21 models for parts from 3 oz. to 5,000 lbs. or more.

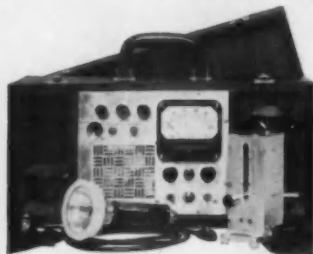
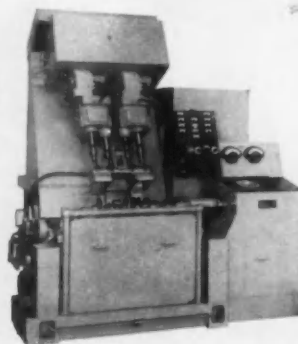


## ElecΦdyne

**Vertical Static Balancing Machines. Optional drill unit for rapid correction.**

## Automatic

**Balancing Machines. 30 or more crankshafts per hour corrected to within 0.25 oz.-in.**



## Vibrodyne

... a new concept in Vibration Analysis and Correction. Fast, accurate "in-place" balancing.

No matter what your requirements, there's a Tinius Olsen Balancing Machine that will cut your balancing time and costs to an astonishing minimum. It will pay you to get the facts about the complete line of Olsen ElecΦdyne Balancing Machines for high speed, low cost production line balancing. Write for Bulletin 49 today.

For further information about the new Vibrodyne Vibration Analyzer and Balancer, send for Bulletin 53.



**TINIUS OLSEN TESTING MACHINE CO.**

2090 Easton Road · Willow Grove, Pa.  
Testing & Balancing Machines

## Outlook for Plastic Car Parts

(Continued from page 113)

when not in use. Air conditioner and heater ducts of reinforced plastic are being used by a number of manufacturers on 1956 models, including Chrysler and Nash. The Chevrolet Corvette, the first production model by a major manufacturer to be equipped with an all-plastic body, was re-introduced this year with new styling and improved performance. A removable hardtop molded from glass-reinforced polyester resin is available as optional equipment. Similar tops are available for the 1956 Thunderbird and a number of other well-known sports cars.

## New Plastics

In addition to the progress being made with glass-reinforced thermosetting resins, recent developments in the combining of synthetic rubbers with thermo-plastic resins offer considerable promise for structural use, especially in automotive interior trim. The styrene copolymers are typical of this class of plastics. Both flexible and rigid materials can be produced by varying the composition of these copolymers, which in sheet form may be readily shaped by conventional vacuum and plug forming techniques. These materials lend themselves to a wide variety of decorative surface treatments. Surfaces may be grained to almost any desired finish. Two-tone color effects may be obtained in much the same way these effects are produced on coated fabrics. Silk screen printing and vacuum metalizing are effective surface treatments for these materials.

Styrene copolymers are tough and stiff and have a useful service temperature range of from -60 to 220 F. In sheet form, they are being used in 1956 models for center pillar covers in four-door hardtop convertibles, in instrument panel trim applications, and for door trim pads. Perhaps, the largest single plastic part ever used on a production model automobile is the headliner, formed from styrene copolymer sheeting, for the 1956 Plymouth Suburban station wagon.

Plastic foams, both polyurethanes and vinyl chloride, are being used extensively for the first time this year. Many of the safety pads on 1956 models are made from these materials. The physical properties of these new plastic foams can be varied over a

# "SWITCH!"

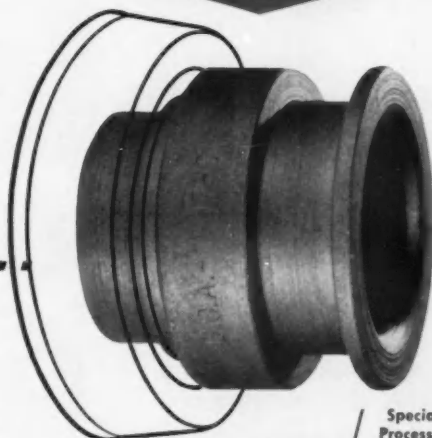
## said Ostuco

### ... and savings were surprising!

Pleasant surprise, Tool Bearings Company of America, Division of Federal-Mogul-Bower Bearings, Inc. Lancaster, Pa., was machining Ostuco seamless tubing to make a clutch release bearing collar used as original and replacement equipment. Results were fine!

Then word came from Ostuco, recommending a switch to Ostuco's newly developed NP-60, tubing specially processed for machineability. Cost was slightly higher, but BCA and Ostuco engineers predicted the savings would justify the change.

*they switched...*



*and they SAVED!*

	Regular	Specially Processed NP-60
Production per 8 hour shift (units) . . . . .	675	840
Production time per 1000 units (hours) . . .	12.35	10.03
Total Labor per 1000 units (man-hours) . .	13.09	10.63

Besides the savings, Bearings Company of America was pleased with the better finish of the new part. They point out that the collar in photo above "shows the finish as it comes directly off the machine."

It happens this way often enough to warrant checking with Ostuco about your tubing applications and production problems. Contact your nearest Ostuco Sales Engineer or write direct to the Shelby factory —there's no obligation!



## OSTUCO TUBING

SEAMLESS AND ELECTRIC RESISTANCE

WELDED STEEL TUBING—Fabricating and Forging

### OHIO SEAMLESS TUBE DIVISION

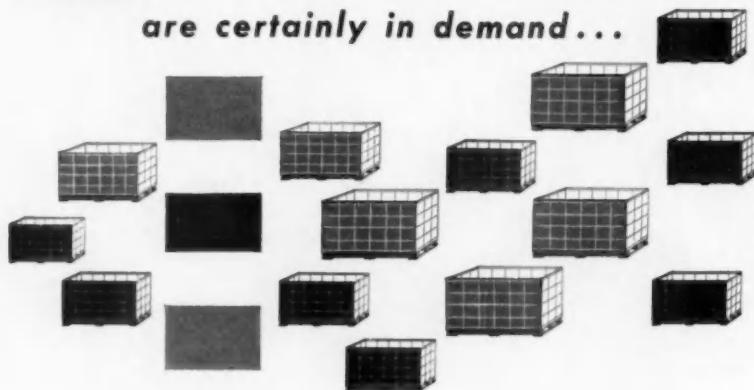
of Copperweld Steel Company • **SHELBY, OHIO**  
Birthplace of the Seamless Steel Tube Industry in America

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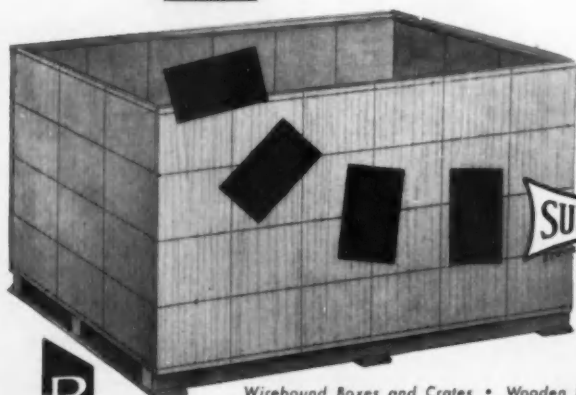
**EXPORT:** COPPERWELD STEEL INTERNATIONAL COMPANY  
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# our **W**irebound Pallet Boxes are certainly in demand...



Ever since we introduced the **SUPERSTRONG** Wirebound Pallet Box we have been receiving a heavy volume of orders—and of favorable comments. Seldom has a new product been greeted with such enthusiasm.

The combination of light weight with strength... the appreciable reduction in materials handling costs—provide the answer. If you do not know all of the advantages of **SUPERSTRONG** Wirebound Pallet Boxes, please let us tell you about them.



Wirebound Boxes and Crates • Wooden Boxes and Crates  
Corrugated Fibre Boxes • Beverage Cases • Starch Trays • Pallets

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**RATHBORNE, HAIR and RIDGWAY BOX CO.**

1440 WEST 21st PLACE, CHICAGO 8, ILLINOIS

wide range according to the requirements of the application. They may be produced in a range of densities and resilience according to need, and fabricated by a variety of techniques. Plastic foams are so new to the industry that many of their potential uses have yet to be developed.

Another promising innovation is the use on 1956 models of "Mylar" polyester film as decorative trims on door panels and other decorative surfaces. This tough, wear resistant film, when embossed in an attractive pattern and vacuum metalized on the reverse side, provides a scuff-proof, soil-resistant surface. An almost endless variety of effects can be achieved by the use of tinted film and different patterns of embossing.

## **Favorable Outlook**

In terms of weight, the amount of plastics of all types used on today's cars is astonishingly small. The average per car in 1956 will amount to 10 lb of material.

What a challenge for the polymer chemist. Economic trends are entirely favorable for a vast increase in plastic sales for automotive uses. The price trends of metals, for example, have been constantly upward over the years; and there is little evidence that this trend will be reversed. The price of plastics, on the other hand, has gone steadily downward. As the volume of plastic production increases, efficiency is improved and production costs go down.

With economics in his favor, the research chemist must do the rest. Materials must be developed having greater stiffness, so that large area panels can be fabricated that will be both rigid and light in weight. Materials less susceptible to dimensional change, as a result of variations in environment, would increase the use of plastics in precise mechanisms. Improved chemical resistance, including resistance to the effects of weathering, would permit wider use of plastics for outside trim and other exterior applications. The ability to tolerate higher service temperatures and to withstand the effects of oxygen and ozone would encourage increased "under the hood" applications. In view of recent progress, there is little doubt that research chemists will be able to meet these challenges.

Chemists must start thinking also in terms of major components having primary functions. The success of a number of mechanical applications in other fields show what can be done in the automotive industry as well. An experimental carburetor fabricated





# Electrical Discharge Machining

saved \$448  
sinking this  
forging die  
using BRASS electrodes

## Conventional Method

Mill Cavity (Man and Machine)	56 hours
Hand Finish (Experienced die sinker)	52 hours
<b>TOTAL</b>	<b>108 hours</b>

## ELOX method

Forge Electrode (Man and machine)	2 hours
Set up and change electrodes (man and machine)	8 hours
Machine hours only (no operator required)	32 hours
Hand finish after E.D.M.	2 hours
<b>TOTAL</b>	<b>44 hours</b>

**Saved: 64 hours at \$7 per hour**

# elox

*corporation of michigan*

**1827 Stevenson Hwy.  
Royal Oak 3, Mich.**

Elox Electron Drills for removing broken taps, drills, etc., from \$495 to \$3450.

### additional EDM advantages in forge die machining:

- Dies are fully heat treated prior to machining thus eliminating possible distortion.
- Resizing forging dies after washout can be done within two hours.
- Inherent workhardening values are retained in the dies since no additional re-heat treating is necessary.
- Actual die life is increased.
- Many forge die alloys are self-polishing after EDM.

This machining application is one of many time and material saving jobs being turned out by the standard Elox M-500 Electronic Machine Tool. See EDM in operation at Elox Demonstration Centers.

\*T.M. Reg.

entirely of nylon performed well when tested on a small utility engine. Timing gears, transmission gears, and similar components fabricated from nylon have performed smoothly in a five hp garden tractor. No great imagination is required to visualize improvements in existing polymers that will permit the design of these components for passenger automobiles.

A few years ago, plastic injection moldings were limited to from 16 to 24 ounces. Today, injection machines

are in operation that can mold 300 ounces or more in one operation. With this kind of progress, it is not too much to expect that one half of an automobile seat could be molded in a matter of minutes, and perhaps even upholstered as it comes from the die. Surely, one day we will be able to injection mold a door panel, a trunk door, or an entire hood as a one-piece unit. With the development of even newer polymers and more refined fabricating techniques, plastics will become a vital factor in the

production of an automobile that will give better performance and cost less than the automobile of today.

*The foregoing is an extract from a paper presented by the author in April, at the national meeting of the American Chemical Society, in Dallas, Texas.*

## New Defense Facilities

**S**UPPLEMENTING the list of Certificates of Necessity issued up to Mar. 7, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the Apr. 15 issue, page 126, of **AUTOMOTIVE INDUSTRIES**, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from Mar. 8 to Apr. 18, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

**AERONCA MANUFACTURING CORP.**, Middletown, Ohio

Aircraft assemblies—\$600,000 (60)

**BEECH AIRCRAFT CORP.**, Wichita, Kans., and Herington, Kans.

Military aircraft—\$288,384 (65)

**BENDIX AVIATION CORP.**, Bendix Products Div., Palmdale, Calif.

Aircraft engine parts—\$209,728 (60)

**BENDIX AVIATION CORP.**, Friez Instrument Div., Towson, Maryland

Scientific instruments—\$55,420 (65)

**BENDIX AVIATION CORP.**, Pioneer Central Div., Davenport, Iowa

Aircraft parts—\$272,493 (45)

**BOEING AIRPLANE COMPANY**, Wichita, Kansas

Military aircraft—\$146,638 (65)

**COOPER ALLOY CORPORATION**, Clark, New Jersey

Airplane engine parts—\$970,000 (40)

**CURTISS - WRIGHT CORP.**, Propeller Div., Caldwell, New Jersey

Aircraft parts—\$124,550 (65)

**CURTISS-WRIGHT CORP.**, Buffalo, New York

Aircraft engine parts—\$13,520 (65)

**DOUGLAS AIRCRAFT COMPANY, INC.**, El Segundo, Calif.

Military aircraft—\$98,825 (65)

**DOUGLAS AIRCRAFT COMPANY, INC.**, Santa Monica, Calif.

Military aircraft—\$843,429 (125)

**EX-CELL-O CORPORATION**, Highland Park, Mich.

Aircraft engine parts—\$166,880 (65)


**HUGHES TOOL COMPANY**, Culver City, Calif.

Aircraft parts—\$92,165 (65)

**KAWNEER COMPANY**, Aircraft Products Div., Niles, Mich.

Aircraft parts—\$238,599 (65)

(Turn to page 124, please)



**DOLE DV**  
**THERMOSTATS**

### ... for best engine performance

Engineered for modern high-compression engine design to give accurate temperature control with pressurized cooling systems. Speeds warm-up—saves gasoline and oil—reduces engine wear. Gets more heat from the car heater.

Now original equipment on thirty-four (34) leading makes of cars, trucks, tractors, commercial vehicles, industrial and marine engines.

Literature sent on request—please use your letterhead.



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Philadelphia



## ***SPECTOR* ...Chicago's largest... standardizes on Fuller ROADRANGERS®**

Spector Freight Systems, Inc., largest common carrier with home offices in Chicago, is adding 104 new tractors equipped with R-46 ROADRANGERS to bring a total of 257 ROADRANGER equipped tractors to its fleet.

Referring to Spector's 149 tractors now equipped with Fuller 8-speed ROADRANGERS, to 4 tractors equipped with 10-speed ROADRANGERS . . . and to the 104 new units with 8-speed Model R-46 ROADRANGERS, C. L. Lunt, Vice President, Operations, says:

"We have standardized on the ROADRANGER Transmission for better over-all fleet performance and less maintenance . . . resulting, of course, in a substantial dollar savings. Also, our drivers overwhelmingly prefer the semi-automatic Fuller ROADRANGER Transmission."

Spector, whose gross revenues rose from \$1½-million in 1945 to an estimated \$21-million in 1955, knows the value of better over-all fleet performance. Spector drivers prefer ROADRANGER 8 and 10-speed Semi-Automatic Transmissions with:



C. L. Lunt, Vice President,  
Operations

- Higher average road speeds—engines operate in peak hp range with greater fuel economy
- Less driver fatigue—½ less shifting
- Range shifts pre-selected—automatic and synchronized
- . . .
- Easier, quicker shifts—all forward speeds in short closely spaced steps between ratios
- One shift lever that controls all forward speeds
- No gear splitting—all selective gear ratios are evenly and progressively spaced

Compact space-and-weight-saving economies permit more cargo to be carried on payload axles. Get full facts on ROADRANGER from your truck manufacturer or truck dealer, now!



**FULLER MANUFACTURING COMPANY**  
TRANSMISSION DIVISION • KALAMAZOO, MICH.

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

End section of Bundyweld Tubing shows exclusive double-walled, single-strip construction (details below). Tubing is uniformly smooth, inside and out, with no bead at lap joints. Bundyweld can be fabricated easily, bends to shortest radii. Copper-coated on all exposed surfaces, facilitating coating, soldering, or brazing operations. Inset shows but a few fabrication processes.



DOUBLE-FLARED



COILED



THREADED



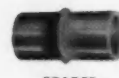
BENT TO  
SMALLEST RADIUS



EXPANDED



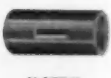
GROOVED



BEADED



BIFURCATED



SLOTTED

**BUNDYWELD IS DOUBLE-WALLED FROM A SINGLE STRIP**



Bundyweld starts as a single strip of copper-coated steel. Then it's . . .



continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Copper coating fuses with steel. Result . . .



Bundyweld, double-walled and brazed through 360° of wall contact.



SIZES UP  
TO 1/2" O.D.

NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.



# Here's the reason why Bundyweld Steel Tubing is used on 95% of today's cars

Only steel tubing can take the punishment;  
and only Bundyweld is double-walled from a  
single steel strip for absolute dependability.

Look closely at the unique construction of Bundyweld Steel Tubing, and you will see the reason why it is specified by automobile manufacturers for safety and dependability.

Because of its strength, durability, and ease of fabrication, Bundyweld is universally used by the industry in brake lines, fuel lines, oil lines, and dozens of other vital automotive uses. It is found *in 95% of today's cars, in an average of 20 applications each.* Only steel tubing can stand up under the punishment; Bundyweld is tough, rugged, takes the wear and tear in stride.

Your product, too, may need these outstanding Bundyweld properties: leakproof by test; thinner-walled yet stronger; high thermal conductivity; easily fabricated; takes easily to standard protective coatings.

Backed by unexcelled engineering and fabrication facilities, Bundy offers a wealth of special services to its customers. Technicians are available, at your request, to help at any stage of your product development where the right answer to a tubing question is vital.

For information, write, wire, or call us today!

**BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN**

## **BUNDYWELD TUBING®**

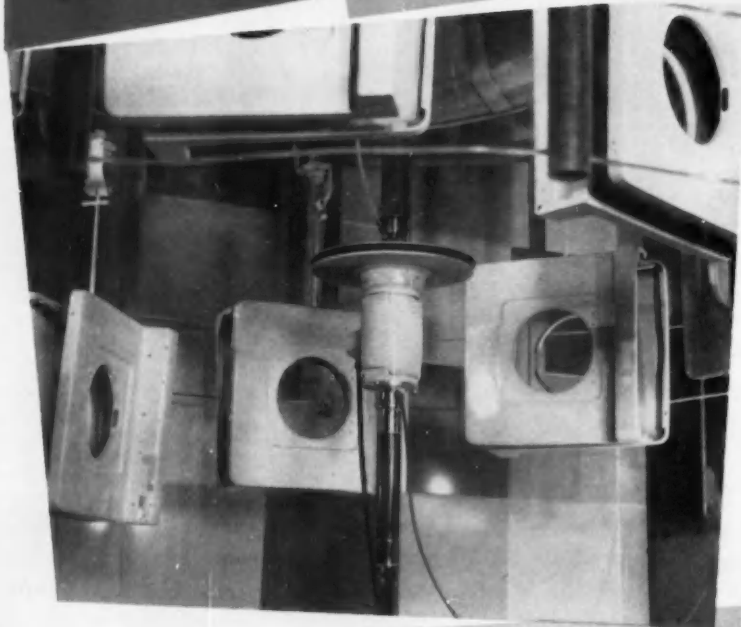
Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • Chattanooga 2, Tenn.: Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • Chicago 32, Ill.: Lopham-Hickey Co., 3333 W. 47th Place • Elizabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 • Los Angeles 58, Calif.: Tubesales, 5400 Alcoa Ave. • Philadelphia 3, Penn.: Rulon & Co., 1717 Sansom St. • San Francisco 10, Calif.: Pacific Metals Co., Ltd., 3100 19th St. • Seattle 4, Wash.: Eagle Metals Co., 4755 First Ave., South • Toronto 5, Ontario, Canada: Alloy Metal Sales, Ltd., 181 Fleet St., E. • Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, ENGLAND, FRANCE, ITALY, AND GERMANY

# NOW

*for the  
first time.*

**PORCELAIN ENAMEL**  
is being applied successfully—  
Yes, even spectacularly—  
with **RANSBURG NO. 2**  
**ELECTROSTATIC SPRAY**  
**PROCESS**



General Electric—an extensive user of Ransburg Electro-Spray for painting with synthetic enamels—is the first to use Ransburg No. 2 Process in the application of porcelain enamel.

GE—less than a year in electrostatic production—now is processing almost a million square feet of cover coat each month in the General Electric Home Laundry finishing department at Appliance Park.

**DRYER TOPS AND WASHER COVERS  
ARE BEING COATED ELECTROSTATICALLY  
WITH THESE SPECTACULAR RESULTS**

Quality of appearance and chip resistance are greatly improved with all colors: white, yellow, pink, turquoise, blue and brown.

About 97% of the atomized enamel is deposited on the washer and dryer parts.

Because of improved uniformity in coating thickness, weight of applied enamel was substantially reduced.

Because of lower application weight, the few rejected parts can be re-processed more times before being scrapped. This reduces the ultimate scrap rate by at least 95% of that previously expected.

Efficiency, measured by the amount of good ware, averages above 90%.

*Want your  
products tested?*

Ransburg has fully equipped laboratory facilities including reciprocating disks, helical conveyors, stationary disks, and the latest advancements in equipment for applying porcelain enamel with the No. 2 Electrostatic Spray Process. Manufacturers are invited to send sample products to our Indianapolis laboratories for tests and demonstrations to prove for you the advantages and benefits of electrostatic spray application of porcelain enamels.

**Ransburg** ELECTRO-COATING CORP.  
Indianapolis 7, Indiana

**RANSBURG**

## New Defense Facilities

(Continued from page 120)

**KEARFOTT COMPANY, INC.**, Little Falls, New Jersey

Aircraft instruments—\$115,140 (65)

**LOCKHEED AIRCRAFT CORP.**, Burbank, Calif.

Military aircraft—\$4,261,072 (435)

**LOCKHEED AIRCRAFT CORP.**, Los Angeles, Calif.

Military aircraft—\$406,069 (65)

**LOCKHEED AIRCRAFT CORP.**, Maywood, Calif.

Military aircraft—\$1,735,000 (60)

**LOCKHEED AIRCRAFT CORP.**, Sunnyvale, Calif.

Military aircraft—\$11,309,000 (60)

**LOCKHEED AIRCRAFT CORP.**, Van Nuys, Calif.

Research air development—\$568,756 (65)

Military aircraft—\$355,737 (65)

**LOCKHEED AIRCRAFT CORP.**, Missile Systems Div., Van Nuys, Calif.

Military aircraft—\$359,496 (65)

**H. W. LOUD MACHINE WORKS, INC.**, Pomona, Calif.

Aircraft parts—\$868,098 (70)

**THE MARQUETTE METAL PRODUCTS CO.**, Cleveland, Ohio

Military aircraft parts—\$242,495 (65)

**MENASCO MANUFACTURING CO.**, Euless, Texas

Aircraft parts—\$4,500,000 (60)

**ROHR AIRCRAFT CORP.**, Chula Vista, Calif.

Military aircraft assemblies—\$750,000 (60)

**THE RYAN AERONAUTICAL COMPANY**, San Diego, Calif.

Aircraft engine components—\$169,374 (65)

**STANDARD OIL COMPANY**, Lima, Ohio

Oil storage facilities—\$950,000 (40)

**THE STANDARD OIL CO.**, Toledo, Ohio

Oil storage facilities—\$250,000 (40)

**UNION CARBIDE & CARBON CORP.**, Bakelite Co. Div., Middlesex County, New Jersey

Research and development—\$8,984,000 (45)

**UNITED AIRCRAFT CORP.**, Hamilton Standard Div., Windsor Locks, Conn.

Military aircraft and parts—\$4,000,000 (60)

**UNITED AIRCRAFT CORP.**, Pratt & Whitney Aircraft Div., East Hartford, Conn.

Military aircraft engines—\$1,281,000 (65)

## Film Shows How Cities Solved Traffic Problems

A new 16 mm movie showing how certain communities have solved their automobile safety, traffic, and highway construction problems is being offered to church, civic, and educational groups by Ford Motor Co. The film is titled "Freedom of the American Road." It can be obtained from either one of these Ford film libraries: 16400 Michigan Ave., Dearborn, Mich.; 16 E. 52nd St., New York 22; 4303 Telegraph Ave., Oakland 9, Calif. There is no charge for use of the film.

AUTOMOTIVE INDUSTRIES, May 15, 1956

*Memo to all  
engine builders  
who want longer  
service from  
piston rings—*

## Sealed Power CHROME-FACED

# Cyclan

### PISTON RINGS deliver unequalled performance!

These rings combine the break-proof qualities of Cyclan with the heat-resistance and wear-resistance of chrome. They are already being used by many Diesel engine builders, with amazing results.

SEALED POWER CORPORATION • MUSKEGON, MICH. • ST. JOHNS, MICH. • ROCHESTER, IND.  
DETROIT OFFICE • 7-236 GENERAL MOTORS BLDG. • PHONE TRINITY 1-3440

## Sealed Power Piston Rings

PISTONS • CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings since 1911  
Largest Producer of Sealing Rings for Automatic Transmissions • Power Steering Units

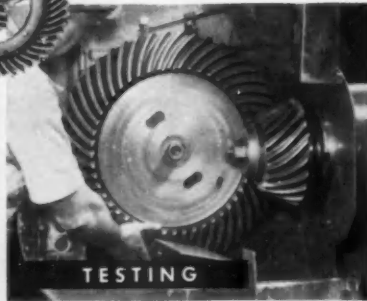


"FAIRFIELD

for FINE GEARS"



PRODUCTION



TESTING



HEAT TREATING



RESEARCH

## WHAT **FAIRFIELD** **Experience MEANS TO YOU**

Experience is the "plus value" that goes into every Fairfield gear at no extra cost. It is your assurance of dependable gear performance combined with the utmost in production economy. By specializing exclusively in "Fine Gears Made to Order" for more than thirty-five years, Fairfield has become one of America's largest independent producers of these parts. This is why many makers of Construction Machinery . . . Agricultural Implements . . . Machine Tools . . . Material Handling Equipment . . . Trucks, Tractors, and Buses now regularly depend on Fairfield to meet their requirements.

Fairfield's facilities are unexcelled. Here, in a new and ultra-modern plant you will find a complete metallurgical department, batteries of the most modern machines, testing laboratories, latest heat treating equipment—all operated by skilled craftsmen working under expert engineering supervision. *For the Best in Gears, Specify Fairfield!*

**FAIRFIELD**  
MANUFACTURING CO.



2303  
S. Concord Rd.

Lafayette,  
Indiana

## Arc Welds in Pedal Production Setup

(Continued from page 57)

Current is then cut off and the whole row of pedal stampings in the magazine is advanced one space, the completed weldment that has passed the second electrode being ejected from the end of the channel into a tote board. After the advance occurs, the next pair of arcs is struck and the cycle repeats.

During each brief welding period at each head, CO<sub>2</sub> is turned on and flows around each electrode to shield the arcs, control of the flow being automatic and precisely timed. Timing is such that 1200 pedals an hour can be welded if the operator keeps the magazine loaded. Although two welds are made simultaneously, only one at a time is made on each piece, as there are two welding positions through which each piece passes in succession.

Welding heads are set so that the electrodes make a 45-deg angle with the tube axes and point into the corners where the tube passes through the channel legs. Only a short space, hardly more than a spot, is covered by the welds, as their purpose is merely to prevent shifting of the tube in the lever and any forces that may tend to cause such a shift are slight.

Only 3½ in. of wire is fed per weld, so a coil of wire is sufficient for about 10,000 welds. Consumption of CO<sub>2</sub> is small and, as the cost of this gas is low, the cost of gas per weld is almost infinitesimal.

### Trolley Buses To Be Built In Brazil With U. S. Help

An understanding was reached recently between Brazilian companies and U. S. concerns to manufacture trolley buses in Brazil. The move would save Brazil \$50 million of foreign currency during a period of five years.

Grassi S. A., a Brazilian company, would make the bodies of the buses according to the plans of Marmon-Herrington Co. Elevadores Atlas S. A., would make the electrical motors and control equipment under a contract with Westinghouse Electric International Co.

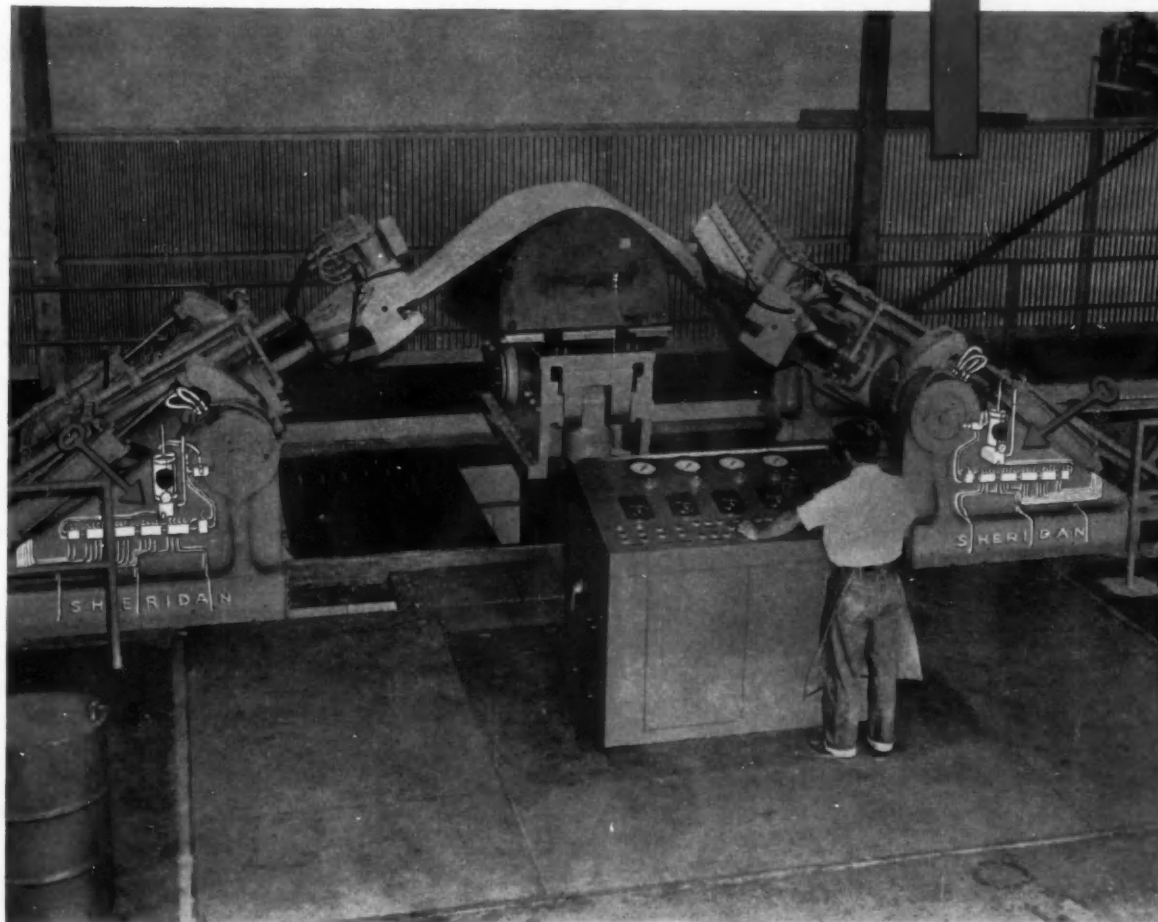
Approximately 10 per cent of the value of each bus is being imported from the U. S. It is planned that initially 20 buses will be produced per month and that the first buses should be delivered in about one year.

**AUTOMOTIVE INDUSTRIES, May 15, 1956**



## Helping a metal stretcher to form 6' x 30' aluminum sheets into plane parts

FARVAL—  
*Studies in  
Centralized  
Lubrication*  
No. 186



● Largest of its type on the West Coast, this 400-ton Sheridan wrap forming machine handles sheets of aluminum and other aircraft metals six feet wide and 30 feet long. It is equipped with a rapid setup panel on which the degree settings are centrally controlled, allowing the operator to work swiftly.

Farval is on the job to make sure that this swift operation continues without interruption. Through Farval's assured protection of bearings, downtime for oiling or for repairing bearings is eliminated. And, Farval contributes further to reduced costs through savings in oiling labor and lubricant.

Farval Centralized Lubrication Systems, manual or automatic, can be installed on new or old equipment. Why not let us send one of our lubrication engineers to inspect your plant equipment? He will present a written analysis of what Farval can do for you—without obligation, of course. The Farval Corp., 3296 E. 80th St., Cleveland 4, O.

*Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing.  
In Canada: Peacock Brothers Limited.*

### KEYS TO ADEQUATE LUBRICATION—

Wherever you see the sign of Farval—the familiar central pumping station, dual lubricant lines and valve manifolds—you know a machine is being properly lubricated.



# Special Techniques For Metal Adhesive Bonding

(Continued from page 68)

Physically, the bonding department breaks down into five sub-divisions: prefit area; cleaning and treatment tank line; adhesive and assembly room; bonding cure room; and final inspection and clean-up area. Equipment involved includes major items such as a vapor degreaser, 11 cleaning tanks nominally 5½ by 3 by 20 ft,

a zinc chromate dip priming tank, a large paint spray booth, a large drying oven, a 5 by 20 ft vacuum platen press, an oil-fired boiler, heat exchangers to heat tank solutions and the press, and various handling dollies, benches, storage racks and so forth.

Because of increased production

requirements, Twin Coach is installing an autoclave, large enough to hold five platens, 5 by 20 ft, which will be used to bond laminated skins and contoured honeycomb assemblies.

Treating tanks were specially designed to specifications because of various linings and unusual ventilation problems, too detailed to mention here. Following is an outline of metal adhesive bonding at Twin Coach:

Master layout or reference templates of assemblies are made from engineering drawings, and parts and tooling are coordinated to this template by tooling holes and pins. Detail parts, identified with metal tags, are checked dimensionally and for flatness.

Incidentally, the fabrication of detail parts is very critical; slight imperfections of edges must be manually worked by using routers, shapers and by hand deburring. Some parts must be straightened after fabrication.

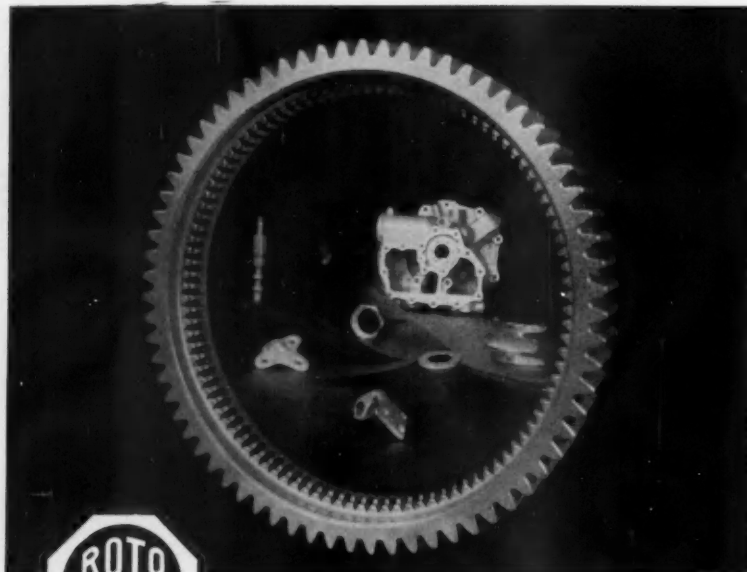
The parts are then sent through the tank line, where their surfaces are thoroughly cleaned and treated to develop "keying" for the application of the adhesives. Treatment methods are different for both metals, magnesium requiring more lengthy processing than aluminum. After parts leave the tank line, absolute cleanliness must be assured. The adhesive and assembly room are air conditioned and pressurized, and the workers are required to wear clean cotton gloves.

Two adhesives are used at Twin Coach: Type I is a thermosetting phenolic liquid solution or suspension; Type II is a tape consisting of thermosetting film compatible with Type I, coated onto a fabric carrier. Both types are stored in air-tight, refrigerated containers; in order to maximum shelf life, the use of adhesives is governed by pre-established maximum time cycles between operations.

In the adhesive room aluminum parts get two spray coats of Type I, with a half hour air dry in between. Magnesium gets a thin dip coat of zinc chromate primer to seal the treated surface, followed by a 90-minute oven dry, 180 to 200 F. Then two coats of liquid adhesive are applied with the first air dried 30 minutes, and oven-dried for 30 minutes at 280 to 300 F.

Parts are next assembled on perforated aluminum, or "cookie sheets," and coordinated with tooling holes. A strip of tape adhesive is inserted be-

(Turn to page 132, please)



*it's the finish that counts!*

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

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**Roto-Finish**  
3713 Millham Road, Kalamazoo, Michigan  
Originators of the Roto-Finish Process



**COMPANY**

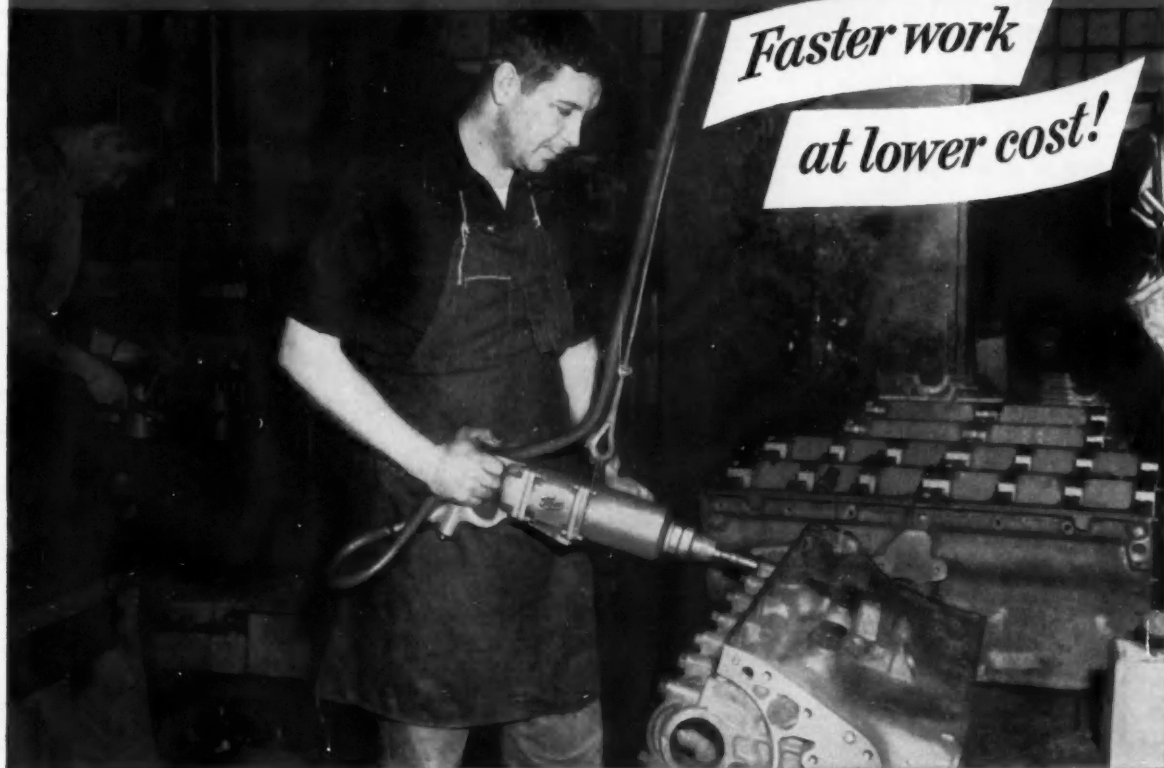
P. O. Box 988  
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Made to order for every industry!

# THOR AIR IMPACT WRENCHES

*Faster work*

*at lower cost!*



**T**HOR Reversible Air Impact Wrenches save a lot of time and money on every operation involving nut running, screwdriving, reaming, tapping, applying and removing studs. Thor Wrenches work faster, with less stress on working parts, because they spin nuts down tighter before impacting. Thor reversible power removes "frozen" nuts, bolts, and screws in seconds. And because there is no torque reaction, Thor Air Impact Wrenches are completely safe.

Low maintenance is assured because Thor ball-bearing motors are fitted into wrenches as self-contained units. Oversize spring never wears out. Finest tool-steel gears are precision cut and heat-treated for endless wear. Thor's line of accessories meets every need. Ask your nearest Thor factory branch for demonstration. Thor Power Tool Co., Aurora, Ill.

## COMPLETE RANGE OF SIZES

Thor Air Impact Wrenches are available in all six of the most-wanted sizes: Bolt size capacities include  $\frac{1}{4}$ ",  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ ", heavy duty  $\frac{3}{4}$ ", and  $1\frac{1}{4}$ ".



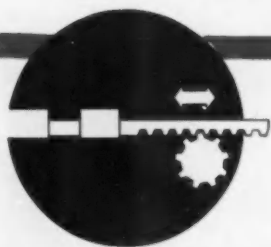
Atlanta • Birmingham  
Boston • Buffalo  
Chicago • Cincinnati  
Cleveland • Denver  
Detroit • Houston  
Los Angeles • Milwaukee  
Newark • Long Island City,  
N.Y. • Philadelphia  
Pittsburgh • St. Louis  
San Francisco • Seattle  
Toronto, Canada • Export  
Division, New York City

**THOR POWER TOOL COMPANY**

AUTOMOTIVE INDUSTRIES, May 15, 1956

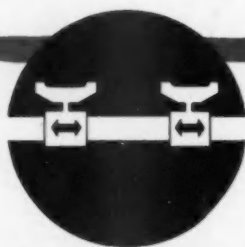
129

# Flexible Automation



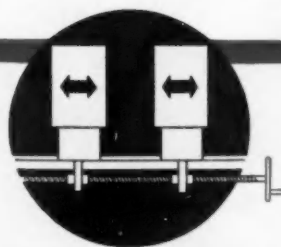
## Variable Length of Feed Stroke

Changing from one job to the next is a simple matter in Transflex. Feed stroke is readily adjusted so that the part may be indexed any distance required by the number and size of the dies used.



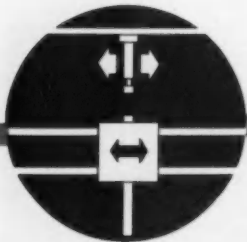
## Adjustable Feed Fingers

Simple adjustments are provided so that the feed fingers can be quickly respaced along the feed bar to accommodate varying feed lengths. Fingers may be easily changed to grip parts of different dimensions.



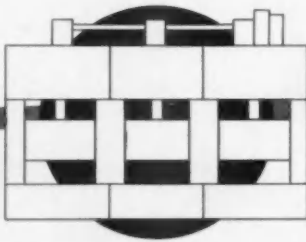
## Adjustable Cushion Positions

Die cushions in a Transflex press are mounted on a track within the press bed. No matter where you want blankholding pressure, Transflex cushions can be moved laterally to that position by an adjustment mechanism outside the bed.



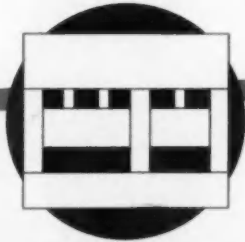
## Adjustable Knockout Positions

Transflex presses are furnished with adjustable knockout positions. Air cylinders prevent the slide from picking up the part on the upstroke. Positive mechanical knockout is also provided in the event a part becomes so firmly seated in the dies that the cylinder remains compressed. Both cylinders and rods are adjustable left and right.



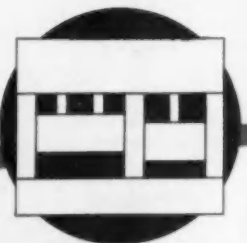
## Modular Construction

An entirely new concept of press design and construction, modular press units provide the manufacturer with a means to alter the physical characteristics of the presses. A manufacturer can now have insurance against long range obsolescence of equipment. Modular construction provides a means to add or subtract crowns, beds, slides and uprights—to create a composite press tailored to the manufacturer's general requirements.



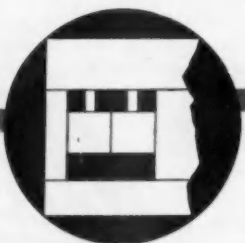
## Multiple Slides

When a series of transfer operations presents extremely unbalanced load conditions, Clearing provides multiple slide construction. Two or more slides with completely different capacities are operated in a single press.



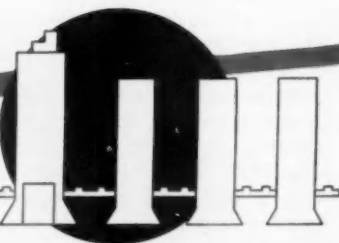
## Skip Stroke

When two parts, which are similar except for one key operation, are to be produced simultaneously, Clearing offers a unique skip stroke action. One slide in a multiple slide press will skip every other stroke to allow the transfer mechanism to index twice. In this way a pair of parts are produced at every second stroke of the press.



## Split Slides

Clearing presses with split slides offer the manufacturers a means to obtain balanced production of pairs of parts where both parts are produced on the same press. Instantaneous die changing is possible by adjusting one slide up and the other one down. Split slide construction eliminates any effects of unequal loading of the slides.



## Lead Press

A manufacturer wishing to automate a line of existing presses may purchase a Clearing lead press equipped with a fully adjustable Transflex feed mechanism. The feed is constructed in incremental units so that the press line can be modified—presses added or subtracted—at any time.



# the new **CLEARING** **transflex press**



## Transfer Feed Efficiency + Flexibility

Here at last is automation *plus* flexibility. The new Clearing Transflex makes it possible to take full advantage of transfer feed operation on a variety of work—to change over from one job to another with a minimum of effort. Stampings manufacturers have, in the past, looked on special purpose transfer feed presses as potential white elephants due to their

highly specialized function. These manufacturers will find in Transflex, an automated press designed to keep pace with design and model changes. Transflex is, in fact, so versatile that *contract stamping shops*, with their requirements for variegated production, are now taking advantage of the economies offered by Transflex operation.

## **CLEARING PRESSES**

THE WAY TO EFFICIENT MASS PRODUCTION

**CLEARING MACHINE CORPORATION** • Division of U. S. Industries, Inc.



6499 W. 65th Street, Chicago 38, Illinois • Hamilton Division, Hamilton, Ohio




1906...1956

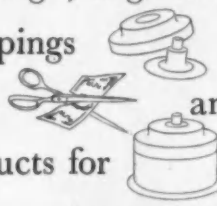

## 50 Years of Stamping Experience...



*All because of You!*




Everyone's proud  when they celebrate their 50th year  in business... and we're no exception...

but people like you made it possible. 

Working with us  you have helped us design, engineer and produce

stampings  that have cut your costs and resulted in better products for  American Industry.

Sure, we have the know-how  the best facilities  but success comes only when customers are satisfied

...so, again, we're proud  but more than that, we're grateful to you  for making these 50 years  possible.

### SHEET METAL SPECIALTY DIVISION



Box 567—Follansbee, W. Va.

A Division of

**FOLLANSBEE STEEL CORPORATION**

Follansbee, W. Va.

## Special Techniques For Metal Adhesive Bonding

(Continued from page 128)

tween bonded faying surfaces. Pressure plates or overlays are put on top of assemblies, now ready for the bonding press.

Assembly edges are taped and the vacuum blanket brought over the parts on the bed of the oil-heated vacuum platen press. Vacuum through the press bed insures good contact for transferring press heat, and vacuum is applied under the blanket to obtain proper bonding pressure.

Thermocouples are installed in the "glue line" of assemblies to record temperatures during warm-up and curing. The warm-up temperature rise must not exceed 12 F per minute. With cure temperature reached, it is held half an hour, then the press is cooled with cold oil until the "glue line" drops below 180 F and the assembly can be removed from the press. Above 180 F, the adhesive is still semi-plastic, and any movement could shift detail parts.

Bonding temperatures and pressures required are:

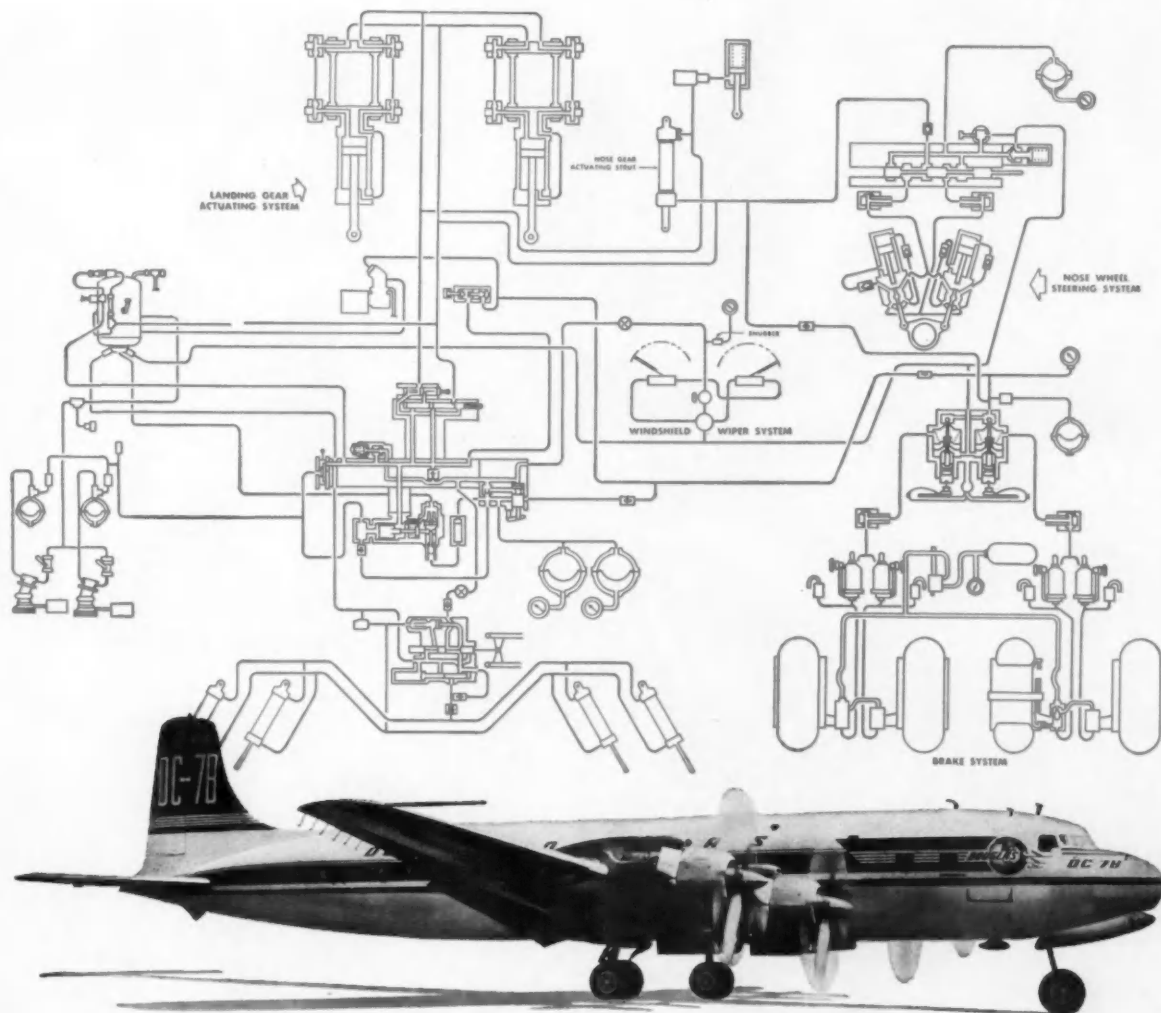
Magnesium to magnesium—  
310 F–340 F at 7.5–50 psi  
Magnesium to aluminum—  
310 F–340 F at 25–50 psi  
Aluminum to aluminum—  
325 F–350 F at 25–80 psi

Test panel assemblies are processed along with production assemblies, and are cut into strips for minimum shear test in a tensile testing machine. Magnesium bonding must test to 2000 psi, aluminum to 2400 psi. Twin Coach has bonded test panels with shear values as high as 3900 psi. Work and inspection records go with each assembly. Should a test panel fail to meet psi requirements, the production units represented by the test panel are rejected.

Following bonding, assemblies get final trimming, and painting if required. After a rigid inspection, they are delivered for final assembly to other Twin Coach departments, largely concerned with contracts for the military.

### AUTOMOTIVE INDUSTRIES...

Is your News Magazine of  
Automotive and Aviation  
MANUFACTURING



## Enjoy Butyl rubber— vital artery in newest airliners

Douglas chooses Enjoy Butyl for rubber components of the hydraulic systems in many of its famous DC-7 airliners. These components, which help assure the dependable operation of everything from wing flaps to landing gear, are proving over millions of air miles their durability and resistance to wear.

Versatile Enjoy Butyl rubber may well have a place in *your* operation. It will pay you to investigate the many technical advantages it has over other types of rubber. Its price and ready availability are advantages, too. For full information, and for technical assistance in the uses of Enjoy Butyl, contact the Enjoy Company today.

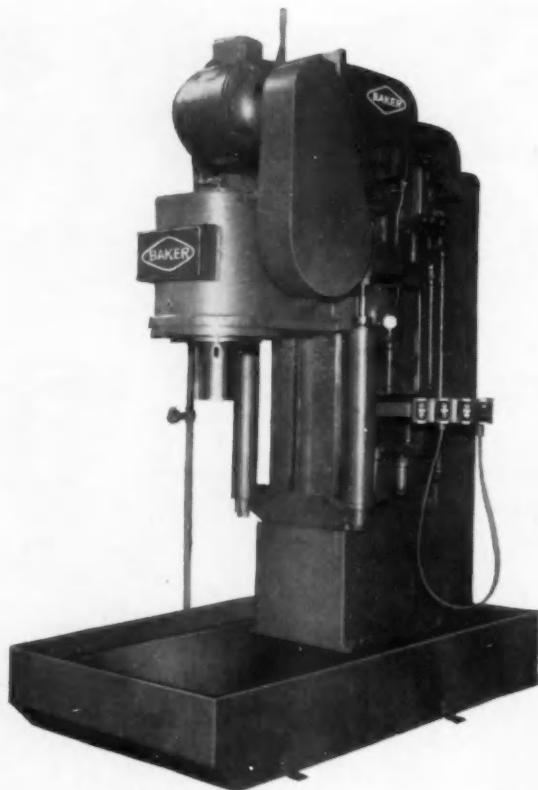


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*Other offices: Akron • Boston • Chicago • Los Angeles • Tulsa*

Enjoy Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.



## automation pays... EVEN ON SHORTER RUNS

Yes, it does — when you automate with *standard* Baker Basic machines. They cost much less than a machine specially built for only one part . . . and pay off quicker. For example, a manufacturer recently installed 3 Baker Basics on relatively low-production jobs. He estimates that the savings through automatic operation will pay for the machines in 3 years or less. Ultimately he will incorporate these Baker Basics into a transfer machine. Baker Basics can be retooled with comparative ease and at less expense. They needn't be completely "rebuilt" for a change in product or production method. For drilling, boring, tapping and other machining operations. In 5 sizes.



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# AI TABLOID

(Continued from page 106)

Grumman Aircraft Engineering Corp. has announced the successful maiden flight of its F9F-8T Cougar fighter-trainer.

Japanese version of the German Volkswagen is reported to be ready for introduction soon.

Ford Motor Co. of Canada has announced a \$4 million expansion of its Ford assembly plant at Oakville, Ont. . . . Norton Co. has purchased additional land for future expansion at its present grinding wheel plant property at Santa Clara, Calif.

Reynolds Metals Co. expects its sales to reach \$500 million by 1958.

Convair Div. of General Dynamics Corp. and Consolidated Electrodynamics Corp. have concluded a licensing agreement by which the latter will manufacture and market Convair's dynamic shock-testing machine.

C. O. Bartlett & Snow Co. has purchased the assets of Grindle Corp. . . . Borden Co. has acquired Resin Industries.

Frederic Flader, Inc., has embarked on a \$625,000 expansion program.

H. O. Canfield Co. has set up Wabash Rubber and Plastics Corp. as a subsidiary to produce plastic items for the appliance and automotive industries at Seymour, Ind.

E. W. Bliss Co. of Canada, Ltd., has announced that its presses and other equipment can now be bought on time in Canada.

Lockheed Aircraft Corp.'s Georgia Division plans a \$7.5 million two-year project to erect an advanced design engineering office building and supporting research laboratories.

Mexico now has almost a million motor vehicles in use.

(Turn to page 146, please)





IN THIS IMPROVED PRESSURIZATION PUMP  
**ONE** AETNA BEARING DOES A  
 FORMER **TWO** BEARING JOB



**RESULT:**

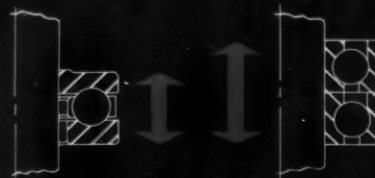
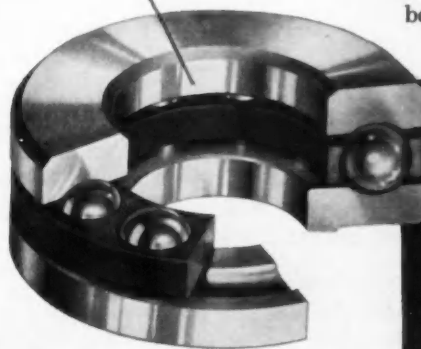
*A LIGHTER, SMALLER PUMP WITH  
 FEWER PARTS **PLUS** IMPROVED  
 PERFORMANCE AND RELIABILITY*

This recently improved variable displacement piston type pump packs more power in less space than any other pump made—has, in fact, notably higher efficiency with a third less of the weight and size of its previous design.

To achieve this significant miniaturization job the pump makers turned to Aetna for assistance in “shrinking” the all-important anti-friction bearing units. You see the result here: one special, space-conserving Aetna thrust bearing tailored to do the job that formerly required two conventional-size angular contact bearings.

This example of how Aetna is helping industry compress its products into smaller, cost-cutting dimensions is not at all exceptional. For 40 years solving difficult friction problems to help make good products better has been one of Aetna's most intensified engineering activities.

We invite you to use that wealth of specialized engineering knowledge whenever you have a ball bearing, roller bearing or precision parts problem.



Cross sections showing comparative size of present and previous bearings. When conserving space is important (as it is in everything aeronautic) dimensional savings like this are real contributions to the aviation industry. Could your product benefit in the same way?

**Aetna**



**AETNA BALL AND ROLLER BEARING COMPANY**

Division of Parkersburg-Aetna Corporation

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Manufacturers of: Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Radial Ball Bearing Mounted Units • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Parts

# New Engines and Cars For the Indianapolis 500

(Continued from page 56)

necessary trussing and support bars of center post steering. Watson expects it to be more positive and quicker-acting.

For better weight distribution, the engine mounting plate is set back four inches from the conventional position.

A seven-gallon oil tank mounted under the hood in front of the engine takes advantage of the rush of cool air over the front of the car. The new car's radiator is 18 in. wide, 4 in. less than the other two Zink entries. Torsion bar suspension is parallel instead of "X." Frame rails

are 4130 chrome-moly tubing of 1½-in. diam, wheelbase is 96 in., front tread width, 50 in., and rear tread, 46 in.

Brakes are Halibrand dual spot disks on all four wheels. An interesting safety measure in the braking system is the use of two master cylinders. Although both are connected to the same brake pedal, each works independently. If one cylinder fails, there's another to rely on.

The car weighs 1700 lb, about 150 lb less than last year's winner. Much of the saved weight is in use of 0.051-in. aluminum sheet, instead of 0.064 in., on hood, nose, and tail sections; and 0.051-in. magnesium sheet for the rest of the body panels. Lighter-weight tubing in the chassis also helps. So, keep an eye on this car, too. Pat Flaherty will drive it.

Will this be the year for Howard Keck's new super-streamliner? This car, under development by Quinn Epperly for several years, has a lot of automotive people guessing. There's little information available. The design is based on scale models tested in the California Institute of Technology wind tunnel. Chief design feature emphasizes extreme light weight and low aerodynamic drag. Best guess on the powerplant: a Meyer & Drake 270.

However, streamlining, highly touted for the 1955 race, won't get much play this year. General objection to streamliners with closed canopies and enclosed wheels is the psychological effect on the driver. It creates a fear of being cooped in and trapped. As for speed, there's still considerable question as to how far to go with streamlining.

Bob Sweikert, 1955's winning driver, will pilot a new car this year, the Art Lathrop D. A. Lubricants Special. Eddie Kuzma built the car. Chassis of the 1700-lb racer is double tube construction of 4130 chrome-moly. Engine support plate and firewall are magnesium. Although the car has dual spot brakes in the rear and single spots in front, there is also an independent emergency braking system. This hand-operated set-up works on a master cylinder that actuates single spots on all four wheels.

Two other new cars from the Kuzma shop are basically like the Lathrop car but without the extra brake arrangement. The one built for J. C. Agajanian, however, features four separate exhaust pipes, one for each port, all coming out the left side. Johnny Parsons, 1950 win-

(Turn to page 140, please)

## PAYLOADER<sup>®</sup> by HOUGH

*is built to be TOUGH!*




### BORG AND BECK

#### CONVERTER and CLUTCH

are coupled in the husky new Model HA "PAYLOADER" to give it a rugged, trouble-free TORQUE CONVERTER DRIVE which multiplies output and provides smooth, shockless power flow for severe service.

Whatever your clutch or converter application, consult our engineering department without obligation. Like Hough, you can always depend on Borg & Beck to come up with the right answer.

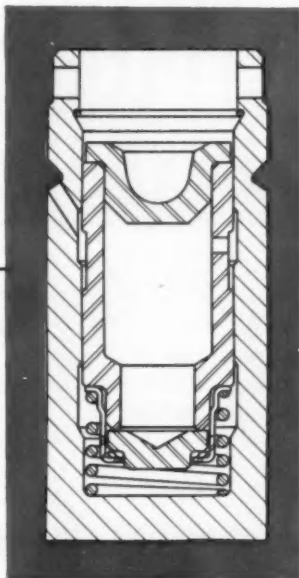
**BORG-WARNER CORPORATION**  
Chicago 38, Illinois

*for that vital spot  
where power takes  
hold of the load!*

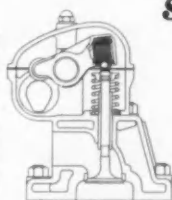


**BORG & BECK**  
DIVISION

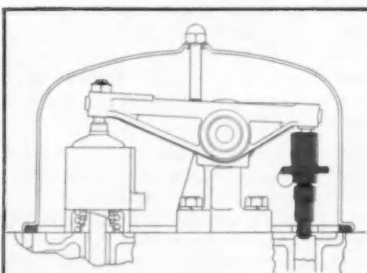
ENGINEERING  
**BW**  
PRODUCTION



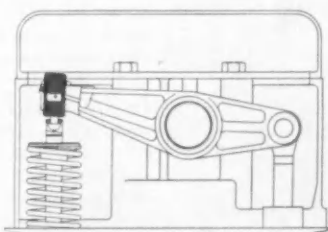
CHICAGO SPRING-LOADED FLAT VALVE HYDRAULIC TAPPET



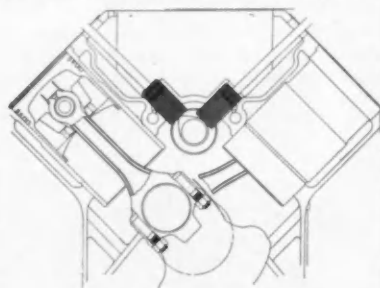
INSERT TYPE ROCKER ARM UNIT



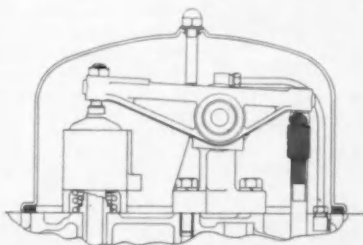
PUSH ROD TYPE FOR COMPRESSION RELEASE APPLICATION



THREADED TYPE ROCKER ARM UNIT



V-8 AUTOMOTIVE HYDRAULIC TAPPET APPLICATION



HYDRAULIC UNIT ON END OF PUSH ROD

## Designing valve gear?

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of complete valve gear installations for any type of engine . . . passenger car, truck, tractor, diesel, aircraft or industrial.

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based on years of specialized experience in valve gear problems. The skills of our engineers will prove a valuable addition to your own engineering staff.

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Division of Standard Screw Company  
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# THE NEW THORNTON **POWR-LOK** WHERE IT IS NEEDED

The new Thornton POWR-LOK for Spicer Axles permits vehicles to operate even though one driving wheel may be on a low-tractive surface such as ice, snow, mud, sand, etc.

With the Spicer Thornton POWR-LOK, up to 80% of the

vehicle's available power is directed to the wheel with traction under any road surface condition. This is another exclusive Spicer development, offered to you only in Spicer Axles as original equipment for passenger cars, and light and medium-duty commercial vehicles.

## The mechanical principles in the Thornton POWR-LOK Differential

In the Thornton POWR-LOK, the torque is transmitted from the differential case to the cross pins and differential pinions to the side gears in the same manner as torque is applied in the conventional differential.

The driving force moves the cross pins B (see fig. 1) up the ramp of the cam surfaces C, applying a load to the clutch rings D and restricts turning of the differential through the friction clutches E. This provides a torque ratio between the axle shafts which is based on the amount of friction in the differential and the amount of load that is being applied to the differential.

When turning a corner, this process is in effect partially reversed. The differential gears become a planetary gear set, with the gear on the inside of the curve becoming the fixed gear of the planetary. The outer gear of the planetary over runs as the outside wheel on the curve has a further distance to travel. With the outer gear over-running and the inner gear fixed, the pinion mates A (see fig. 2) are caused to rotate, but inasmuch as they are restricted by the fixed gear, they first must move pinion mate shafts B back down the cam surface C relieving the thrust loads on the cone clutches E. Thus when turning the corner, the differential, for all practical purposes, is similar to a conventional differential and the wheels are free to rotate at different speeds.

The engagement of the clutches in the Thornton differential provides many features in this unit that are not common in other types of locking differentials. On straight driving, the clutches are engaged and thus prevent momentary spinning of the wheels when leaving the road or when encountering poor traction. In turning a corner, the load is relieved from the clutch surfaces so that wear is reduced to a minimum.

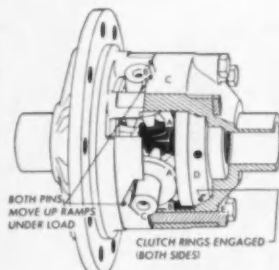


Fig. 1

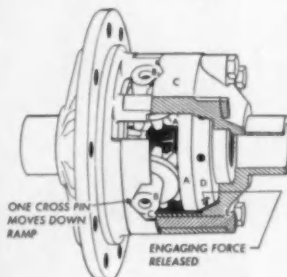


Fig. 2

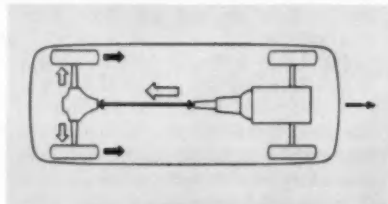


**DANA CORPORATION • TOLEDO 1, OHIO**



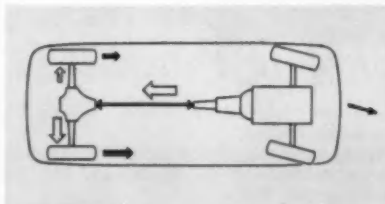
# DIFFERENTIAL PUTS PULLING POWER WHEN IT IS NEEDED!

## How the Thornton POWR-LOK Differential works in typical driving situations



### Power Flow in Forward Driving

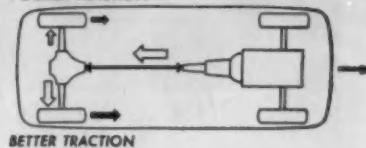
In normal forward driving, the power flow in both the POWR-LOK and conventional differential is transmitted equally to each axle shaft and wheel. However, when one wheel suddenly loses traction on loose or slick surfaces, the POWR-LOK prevents this wheel from spinning, gaining momentum, and swerving the vehicle when good pavement is regained.



### Power Flow in Turns

In turning, the POWR-LOK Differential gives normal differential action and permits the outer wheel to turn faster than the inner wheel. At the same time the POWR-LOK differential applies the major driving force to the inside rear wheel, improving stability and cornering.

### POORER TRACTION

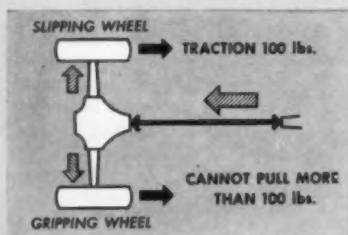


### Power Flow with Poor Traction

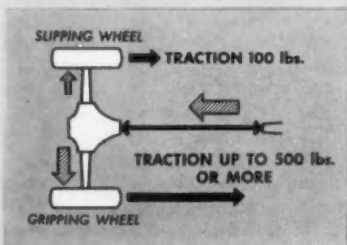
When traction conditions under the rear wheels are dissimilar, the driving force with an ordinary differential is limited by the wheel with the poorer traction. The POWR-LOK Differential enables the wheel with the better traction to apply the major driving force to the road. In this way the POWR-LOK equipped vehicle can operate in snow, ice, and mud which might stop a conventionally equipped unit.

With the Thornton POWR-LOK the wheel on the pavement continues to drive the car, and the wheel on the shoulder does not spin. In this way complete vehicle control is maintained and there is no dangerous swerve.

## Comparative actions in starting a vehicle in snow, ice, mud, sand, etc.



Snow at the curb presents a typical problem encountered by all types of vehicles in the winter months. This condition often offers traction on one wheel and no traction at the curb driving wheel. With the ordinary differential the curb wheel spins in the snow and the vehicle is stuck, as driving power to both wheels is equal and limited by the poor traction of the slipping wheel.

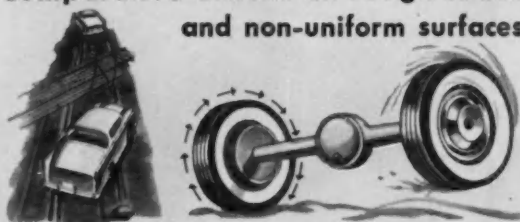


the wheel with the better traction enables the vehicle to be operated in mud, sand, snow and on ice which would stall a unit with an ordinary differential.

Under the same conditions the Thornton POWR-LOK differential applies many times the driving force of the curb wheel to the wheel on the street with the better traction, and the vehicle starts normally.

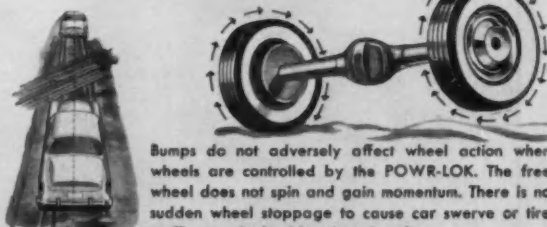
Similarly, the Thornton POWR-LOK's characteristic of applying the major driving force to

## Comparative actions on rough roads and non-uniform surfaces



When a rear wheel is thrown into the air by a bump or obstruction and road contact is broken, the ordinary differential spins the wheel which rapidly gains momentum.

When this rapidly-spinning wheel hits the road surface, the sudden shock causes the car to swerve and the tire to scuff.



Bumps do not adversely affect wheel action when wheels are controlled by the POWR-LOK. The free wheel does not spin and gain momentum. There is no sudden wheel stoppage to cause car swerve or tire scuffing, and wheel hop is reduced.

These characteristics of the Thornton POWR-LOK differential contribute substantially to highway safety through improved high speed stability and handling of the vehicle.

Write for brochure illustrating and describing the efficiency and safety aspects of the new Spicer Thornton POWR-LOK Differential.

## ALUMINUM FINISHES



by A. B. HOEFER  
vice president  
FREDERIC B. STEVENS, INC.

## THE FINISHING TOUCH

### Will Anodized Aluminum Replace Nickel-Chrome Finishes?

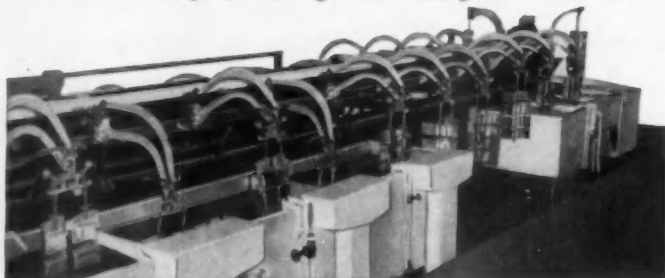
Affirmative answers to this question are revealed in several current business publications and our own sales figures.

Speeding the change is the continued tight supply of nickel. Manufacturers have been forced to look for substitutes for nickel and like the results anodized aluminum have given them.

*A trend is developing.* Volume of Stevens Automatic anodizing equipment sold in 1955 was nearly double the volume for the two preceding years. At the same time, sales of Stevens compositions used in buffing and polishing aluminum were showing a 50% increase.

Frederic B. Stevens, Inc., manufacture equipment for both nickel-chrome and aluminum finishes. We believe both types of finishes will increase in demand but at the moment the interest in aluminum is high.

If you are considering aluminum for your product, you can be assured that aluminum parts can be bright anodized and finished to compare favorably with the fine finish of chrome plate. In addition, aluminum can be dyed, resulting in non-fading colored finishes.



Typical Stevens Automatic Processing Machine Used for Bright Anodizing

Stevens aluminum anodizing equipment is presently being used and recommended in the finishing of colored anodized tumblers, utensils, refrigerator components, rivets, automotive trim, lighting reflectors, etc.

Stevens' experience in furnishing complete anodizing equipment installations assures you of the latest techniques—the finest finishes—at the lowest costs.

For long range planning consider the versatility of Stevens Automatic equipment. Changes of cycles or processes can be accomplished quickly and inexpensively. Your Stevens Automatic Processing Machine for anodizing can be changed to a nickel-chrome cycle at a later date.

If your design engineers are talking of aluminum to add sales appeal excitement, cost reducing features to your new product lines, let us discuss your requirements with you.

For further information write to Frederic B. Stevens, Inc., Detroit 16, Michigan.



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FROM CASTINGS OR STAMPINGS TO  
FINISHED PRODUCT

BRANCHES:  
Buffalo • Cleveland • Indianapolis • New Haven

## Indianapolis 500

(Continued from page 136)

ner, will carry the Agajanian banner this year.

Kuzma's other new car, the Pete Schmidt Special, features an 8 in. offset engine canted at 36 deg. It uses an aircraft-type quick refueling device that automatically shuts off fuel flow when disconnected. This should help prevent pit fires from fuel spillage.

The Jones & Maley Special, with a Meyer & Drake 270, qualified at 140.1 mph last year. It has these interesting new features: (1) a new front axle with adjustable caster; (2) improved safety factor by elimination of many weld areas on the axle, using bolted flanges inside the suspension hanger support assemblies on the axle; (3) reworked shock absorbers that allow greater movement resulting in an easier ride.

The car has a new fuel filler intake cap designed by Dale Drake. Twin four-inch intake holes replace the conventional single six-inch hole. This twin-holed assembly permits faster fueling and a visual check on the fuel level. The extra hole also makes for improved venting. Lids over the twin openings are cast aluminum with a single bar for fast one-hand opening and closing.

There's something new in brakes this year—triple spot disks for rear wheels. Look for some six or eight cars to use them. The new unit, closely resembling those on some jet planes, weighs almost half again as much as dual spot brakes, 4 lb vs 2.5 lb. And they'll give 25 per cent quicker stopping, according to manufacturer Ted Halibrand, Halibrand Engineering Co., Culver City, Calif.

Housing for the brake disk is a magnesium casting. The revolving disk is Meehanite. A new-type master cylinder exerts 600 lb pressure on the revolving brake disk shoe. For the drive plate, Halibrand used 356 aluminum alloy.

Three pins protruding from the rear of the brake shoes are automatic brake adjustment shanks. These automatically compensate for brake lining wear and keep brake adjustment at a constant predetermined level.

Brake shoe lining improvements include higher-heat-resistant material and thicker lining, 5/8 in. deep vs 7/16 in. or 1/2 in. Brake fluid has an over-400F boiling point.

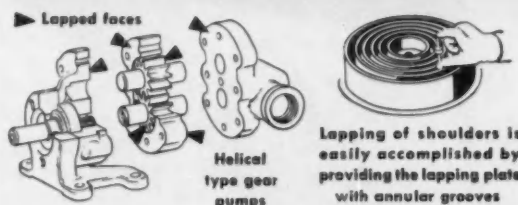
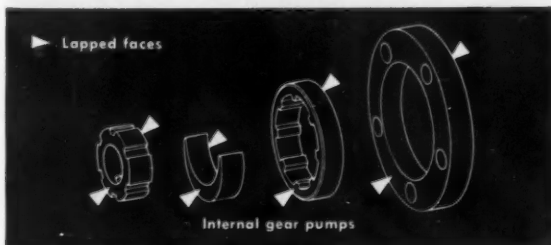
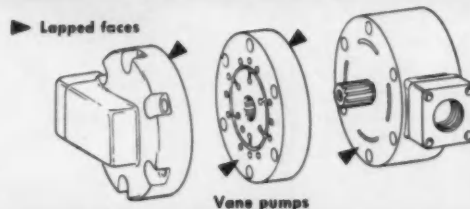
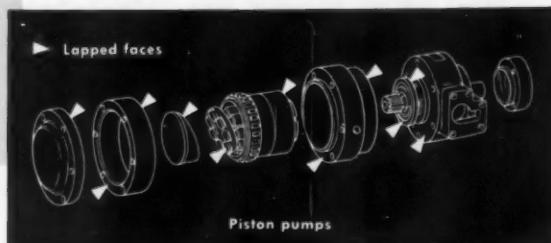
Firestone Tire & Rubber Co. is coming up with new tires again this

# How Pump Manufacturers Use the

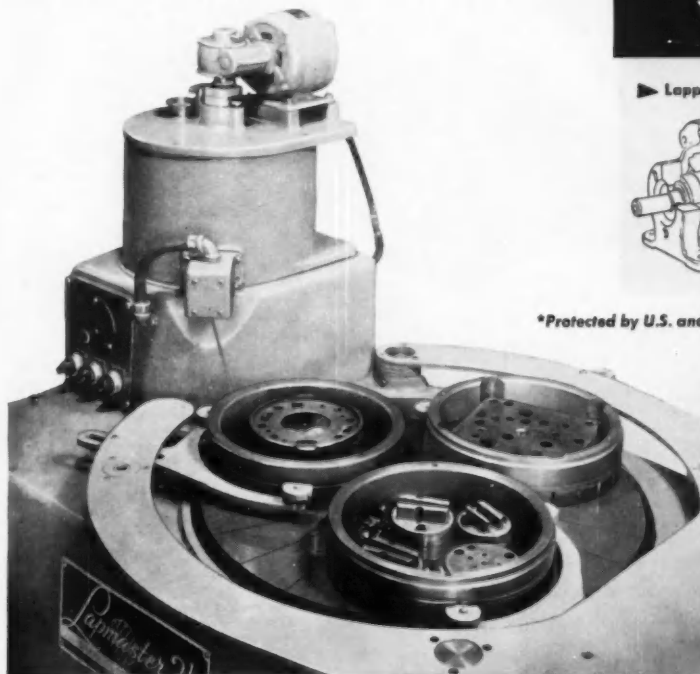
## *Lapmaster*<sup>®</sup> To Improve Product Performance

Like valve manufacturers, a large number of pump manufacturers need precision flatness and finish in order to insure efficient product performance. They're getting *both* flatness and finish plus parallelity in production quantities with Lapmasters. Photos at right illustrate a few typical parts being machined daily.

The high production accuracy of the Lapmaster (micro-inch finishes of 2 to 3 RMS—surface flatness to less than .000011" when required) is being achieved on all materials including cast iron, steel, stainless steel, magnesium, aluminum, brass, carbon, ceramics, plastics and sintered metals. It will pay you to investigate this modern precision, yet economical, method of machining.



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year. Construction design aims at greater strength and better ability to dissipate heat.

Racing enthusiasts expect stepped-up speeds both during qualification and the race because the resurfaced track has its approaches and curves smoothed and bumps removed. What will this do to the tires? Stepped-up speeds in the turns will increase friction and heat.

Firestone says it is compensating for this bigger wear factor by a completely new abrasion-resistant compound and new nylon construction. The company expects the new material to give better wear and improved holding characteristics.

Front tire will have two circumferential ribs. Only one size is made for the front: 760 x 16. Rear tire, with three circumferential grooves, comes in three sizes: 800 x 16, 800 x 18, and 800 x 20.

## BOOKS...

ASTM SPECIFICATIONS FOR STEEL PIPING MATERIALS, published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$4.00. The 1955 edition of this compilation, sponsored by ASTM Committee A-1 on Steel, contains specifications for carbon-steel and alloy-steel pipe and tubing. These specifications cover pipe used to convey liquids, vapors, and gases at normal and elevated temperatures; still tubes for refinery service; heat exchanger and condenser tubes; and boiler and superheater tubes. To make the volume more complete, specifications have also been included for the following materials used in pipe and related installations: castings, forgings, bolts and nuts.

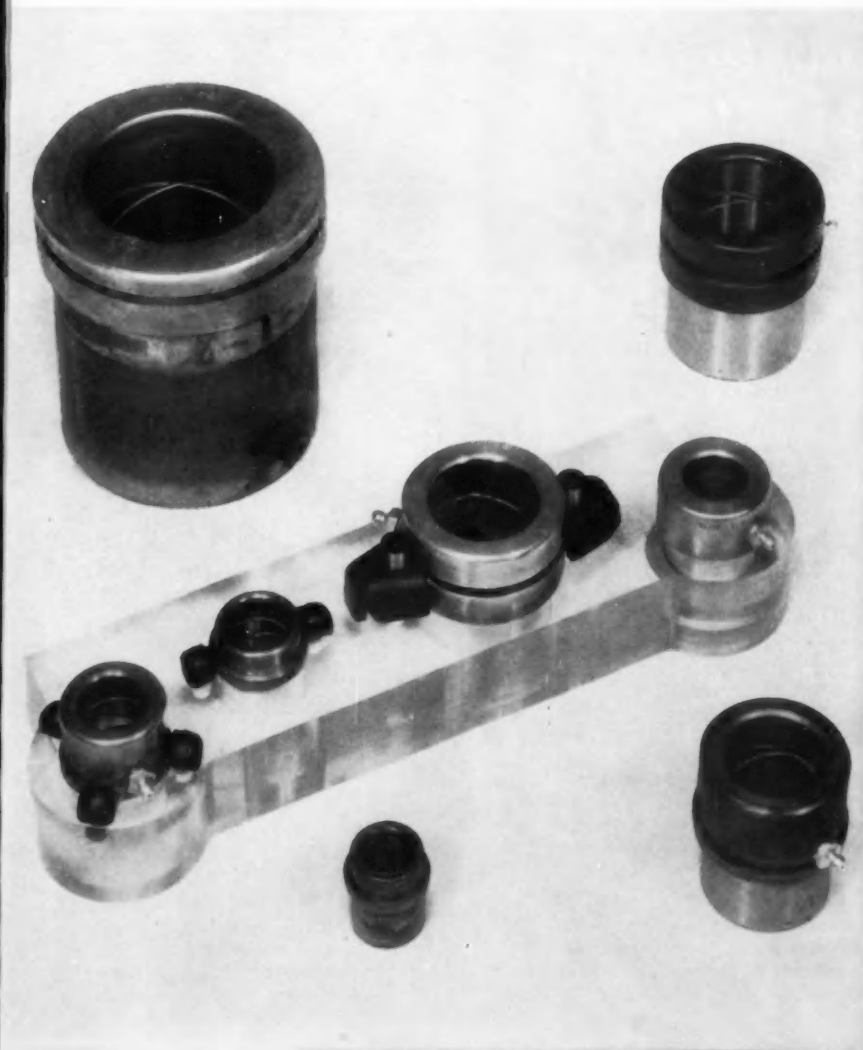
THE BRITISH COMMERCIAL VEHICLE INDUSTRY, by the staff of The Commercial Motor, published by Temple Press Ltd., Bowling Green Lane, London, E.C.1, England. Price 42s. The fifth edition of this comprehensive British reference book has been extensively revised, although the general layout is the same as before. Separate sections deal with trucks, buses, municipal and specialized vehicles, bodies, units and accessories. The sections devoted to the body-building industry include a complete listing of truck and passenger car body builders, with supporting illustrations. Also included is a geographical index showing the locations of British manufacturer's overseas factories, agents and distributors.

POWDER METALLURGY—NOW, by F. V. Lenel, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$1.50. This is a reprint of the Fourth Gillet Memorial Lecture which was presented at the 1955 annual meeting of the ASTM. In his discussion of powder metals, Dr. Lenel evaluates some of the developments in powder metallurgy since World War II, paying particular attention to the improved properties of its products and to new powder metallurgical techniques. Among the topics covered in Dr. Lenel's lecture are the use of powder metals in so-called structural parts, aluminum powder metallurgy, pellet extrusion of magnesium alloys, beryllium powder metallurgy, and powder rolling.

AUTOMOTIVE INDUSTRIES, May 15, 1956



# How a better precision-fit Guide Pin Bushing\* is made in less time with **SHELBY SEAMLESS MECHANICAL TUBING**



Here is another manufacturer that is turning out a better product in less time by using Shelby Seamless Steel Tubing.

The product, a wring-fit bushing, makes possible a truly precision die set, which permits closer working tolerances and extends the life of the dies to a degree never before thought possible. The bushing itself is harder, stronger, more uniform, longer lasting and better fitting.

When Shelby Seamless Tubing is used, no boring is necessary—the hole is already there. It offers more, however, than just a pre-bored hole. It combines to an exceptional degree the qualities of strength, uniformity, and dimensional accuracy. These advantages, coupled with the workability and excellent machining properties of Shelby Seamless, make it the ideal material for critical mechanical applications like this.

Available in a wide range of diameters, wall thicknesses, various shapes and steel analyses, Shelby Seamless Mechanical Tubing is produced to exacting standards by the world's largest manufacturer of tubular steel products. Get in touch with our engineers if you would like help in applying Shelby Seamless to your specifications.

\*Manufacturer's name on request.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.  
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS  
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



## **SHELBY SEAMLESS MECHANICAL TUBING**

U N I T E D   S T A T E S   S T E E L

## BUSINESS PULSE

(Continued from page 98)

### Continuing Expansion

Just now the prospect seems to be for at least moderate continuing expansion in governmental spending and in plant and equipment outlay, and perhaps also in construction expenditures, since the recent volume of contract awards has been very large. Since these sectors in combination account for approximately one-third of gross national product it might seem

that a continuing uptrend in over-all activity would be likely even if retail trade should do nothing more than move along a plateau.

Yet this is by no means a certainty, for it has to be remembered that inventory accumulation—which is now a very important prop to general business volume—may taper off and indeed vanish before the year is out. The question is whether expanding tendencies in governmental spending, business investment, and construction—if they do in fact persist—will fully offset the disappearance of the inventory stimulus, if and when that occurs.

At present the question cannot be answered. Anything less than full compensation for a decline in inventory accumulation could result for a time in a more or less static situation. Such a state of affairs would presumably be accompanied by a gradual rise in the number of unemployed owing to the normal growth of the labor force.

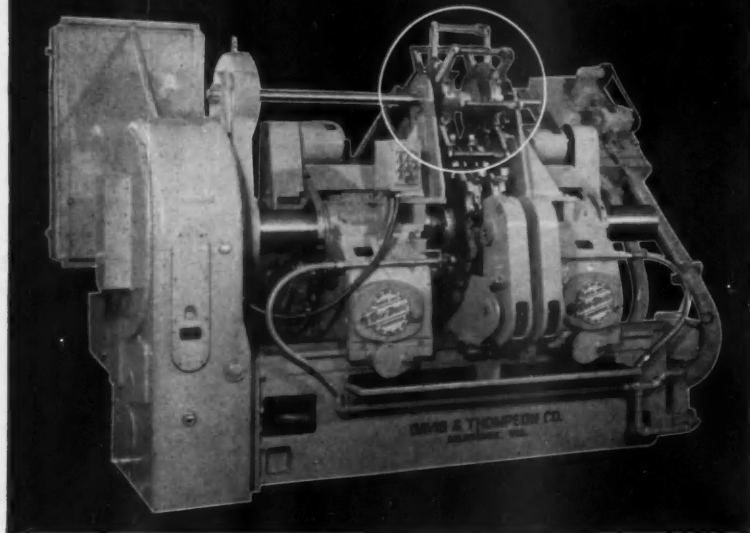
### Economic Picture Hazy

The foregoing is, of course, not a prediction. It is merely one plausible possibility that could come to pass in the later months of the year. There are many others, depending on what assumptions one makes with respect to such things as the pattern of inventory changes and the reception by the public of 1957-model automobiles when they are introduced this fall.

The fact that the emergence of a static business situation in the second half of this year does seem plausible points up, however, the reason for honest and legitimate differences of opinion regarding the Federal Reserve's decision to raise discount rates. The issue hinges on how current business tendencies are evaluated.

Regardless of what evaluation a particular individual makes, there is one gratifying thing about the Federal Reserve's action that should not be overlooked. The very fact that Reserve officials were willing to take action at a time when it was a foregone conclusion that the wisdom of their decision would be questioned testifies to their independence, courage and devotion to the cause of stable money. Most specifically, it is an effective answer to the people who said that Reserve officials would not dare to take action which might tend to check the boom in an election year.

## ...Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.



## Davis and Thompson Co.

4480 N. 124TH ST. MILWAUKEE 10, WISCONSIN

### SAE Summer Meeting Program To Cover Variety of Topics

Opening on June 3 and running through June 8 at its usual Chalfonte-Haddon Hall site in Atlantic City, N.J., the forthcoming SAE Summer Meeting bears every portent of being one of the most interesting ever held. A wide variety of current problems of importance will be studied at the technical sessions and symposiums.

Among the subjects to be covered during the event are: fuels and lubricants; seating; engines; automotive air conditioners; safety; radiators; plastics; brakes; transmissions; axles; engineering materials; and transportation and maintenance. In addition to the business of the meeting, an extensive social program is planned.

# Protect your truck's good name with a heater designed for trucks



Free Consulting Service and Heater Catalog! At no cost to you, one of our engineers will call to discuss your heater problems for any truck model, present or future. And write now for your free Evans heater catalog! Address: Evans Products Company, Dept. P-5, Plymouth, Mich.

REGIONAL REPRESENTATIVES: Cleveland, Frank A. Chase • Chicago, R. A. Lennox Co., Inc. Detroit, Chas. F. Murray Sales Co. • Allentown, Pa., P. R. Weidner.



Do the heaters you install in your trucks measure up to the high quality you build into those trucks? If they're Evans heaters you can be sure they match your trucks in quality, performance and long life. *Here's why . . .*

## Custom-designed by heater engineers

Evans original-equipment heaters are designed into your trucks as integral parts—to save you installation time and cost, to blend into design and space allowances of your trucks, and to provide full-balanced comfort, ventilation and defrosting for any kind of weather. Evans truck heating engineers work closely with your engineers. And the cost is less than you'd think for a genuine, custom-designed truck heater!

## Rigidly tested in Evans' modern laboratory

Evans has one of the most extensive, most complete testing laboratories of any independent truck heater manufacturer. Each custom-designed heater and its components must pass all of Evans' rigid specifications with flying colors before being released for manufacture. And Evans backs its testing policy to the hilt with a parts "repair or replace" warranty on every heater, good for one year or 50,000 miles, whichever occurs first!

## Tailor-built for your specific truck models

Evans engineers make sure that the heater custom-built for each of your specific truck models is not a "tacked-on" or "bolt-it-here-maybe" type, but an actual integrated unit built compactly and neatly into the truck. That's why Evans heaters, complete with *your own nameplate*, look like the quality products of your own factory!

**EVANS PRODUCTS COMPANY** also produces: railroad loading equipment; bicycles and velocipedes; Evanair fir plywood; and Evanite battery separators.

# NIKOH



## Quality Tubing

### the right tube for trouble-free fabrication

Tough, flexible and versatile in application, Nikoh electric-welded steel tubing affords trouble-free fabrication ... cuts costs, increases strength, reduces unnecessary weight and improves the efficiency and appearance of diversified products.

Nikoh Tubing is available in round, square, hexagonal and other special shapes, and is manufactured in diameters from 1/4" to 4" with wall thicknesses from .015" to .190". And Nikoh's enlarged fabricating department will shape the tubing to your exact specifications.

Investigate how Nikoh Tubing can be used advantageously in *your* product. Our service-minded engineering staff will give you close, friendly cooperation.



*It pays to plan with Nikoh*

## NIKOH TUBE CO.

5000 S. WHIPPLE ST. • CHICAGO 32, ILL. • GRevehill 6-6500



(Continued from page 134)

Thor Power Tool Co. will construct a new plant for its Speed-Way Manufacturing Co. division at LaGrange Park, Ill. ... Kendall Co. will erect a new million-dollar plant for manufacturing its Polyken pressure-sensitive industrial tape and plastic protective tape coatings at Franklin, Ky.

\* \* \*

U. S. Chemical Milling Corp. is now removing metal from airframes or other parts by chemical etching.

\* \* \*

American Management Association has prepared a series of films on how business management can improve its decisions with the aid of electronics.

\* \* \*

Mexican tire manufacturers have asked for an increase in tire prices. ... Mexico's national rubber industry now represents a total investment of more than \$40 million.

\* \* \*

Massachusetts Institute of Technology will hold a special course on "Modern Developments in Heat Transfer" from June 18 to 29.

\* \* \*

B. F. Goodrich Chemical Co. plans an \$8 million expansion at its Avon Lake, O., Plant.

\* \* \*

Kaiser Aluminum & Chemical Corp. plans a 55-million-pound-per-year increase in capacity at its Chalmette, La., primary aluminum reduction plant.

\* \* \*

General Electric Co. will build a line of nine Diesel-electric locomotives that can be used on almost any railroad in the world.

\* \* \*

Pacific district offices of the GE Carboly Dept. are now located at 2106 West Washington Blvd., Los Angeles, Calif. ... Office of the Detroit Technical Section of the International Nickel Co.'s Development and Research Div. is now located at 19842 James Couzens Highway, Detroit 35, Mich.

\* \* \*

Battelle Institute has established a Systems Engineering Div.

(Turn to page 148, please)



# 1085

standard sizes



only **Oilite**

gives you such a wide range of self-lubricating bronze bearings ***from stock***

**1085** STANDARD SIZES of OILITE self-lubricating bronze bearings now are available to you through your local OILITE Dealer.

Now you save set-up and tooling costs on standard OILITE bronze self-lubricating bearings. From a total of 1085 standard sizes in OILITE bronze bearing stocks—including 315 new standard sizes—you can fill nearly all of your self-lubricating bronze bearing requirements. Faster! Economically! In any quantity!

For non-standard sizes, you can order ferrous and non-ferrous OILITE bearings produced from any one of 25,000 dies at our plant—for sleeve, flange, thrust and

spherical bearings. There is no charge for their use; only a nominal set-up cost on quantities of less than 1000.

And for help on unusual bearing problems you can call upon the unmatched engineering skill of Chrysler-Amplex in powder metallurgy.

You'll want the new OILITE Bearing Stock List S-56 which gives the 1085 standard OILITE bronze bearing sizes and the complete list of OILITE bronzed, bar and plate material from stock. It's free! Write us today or phone your local dealer. He is listed in the Yellow Pages of your telephone book under "Bearings—OILITE."



ONLY CHRYSLER MAKES OILITE

**AMPLEX DIVISION**

CHRYSLER CORPORATION • DETROIT 31, MICHIGAN

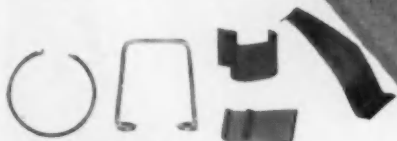
Bearings • Finished Machine Parts • Permanent Metal Filters • Friction Units

# AUTOMATIC SPRINGS ...

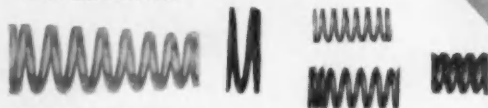
ARE QUALITY CONTROLLED\*



FLAT & POWER SPRINGS



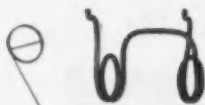
CLIPS AND SHAPES



COMPRESSION SPRINGS



EXTENSION SPRINGS



TORSION SPRINGS



ENGINE VALVE SPRING

\*Quality control is maintained in every spring made by AUTOMATIC. This starts with control of the quality of the raw materials used, and continues on through every step and stage of manufacture to the finished product. For quality controlled springs—quality controlled to fit your particular need—specify AUTOMATIC SPRING on your next order.



for quality springs "Automatically" think of

## AUTOMATIC

SPRING COILING CO.

4048 West Thorndale Ave., Chicago 30, Ill.

# AI TABLOID AI

(Continued from page 146)

Republic Aviation Corp. has signed an agreement with a large German concern for providing technical assistance, facilities, equipment, and personnel to the German Air Force as deliveries of Republic's F-84F Thunderstreak and RF-84F Thunderflash aircraft begin.

\* \* \*

Dow Chemical Co. plans to spend \$75 million on new construction in 1956.

\* \* \*

Air France has placed orders for 10 Boeing Intercontinental jet transports, while Sabena Belgian World Airlines has contracted for three.

\* \* \*

Bell Aircraft Corp. is said to be working on a new guided missile project.

\* \* \*

Steel companies in the U. S. plan to add about five million tons to their steelmaking capacity each year for the next three years.

\* \* \*

W. R. Grace & Co. has selected a site near Baton Rouge, La., for its polyethylene project.

\* \* \*

North American Aviation, Inc. plans to construct a \$3.3 million headquarters building for its Autometrics Div. at Downey, Calif.

\* \* \*

Clark Equipment Co. has announced the opening of its new Materials Handling Development Center.

\* \* \*

Studebaker Transtar trucks now have tubeless tires as standard equipment.

\* \* \*

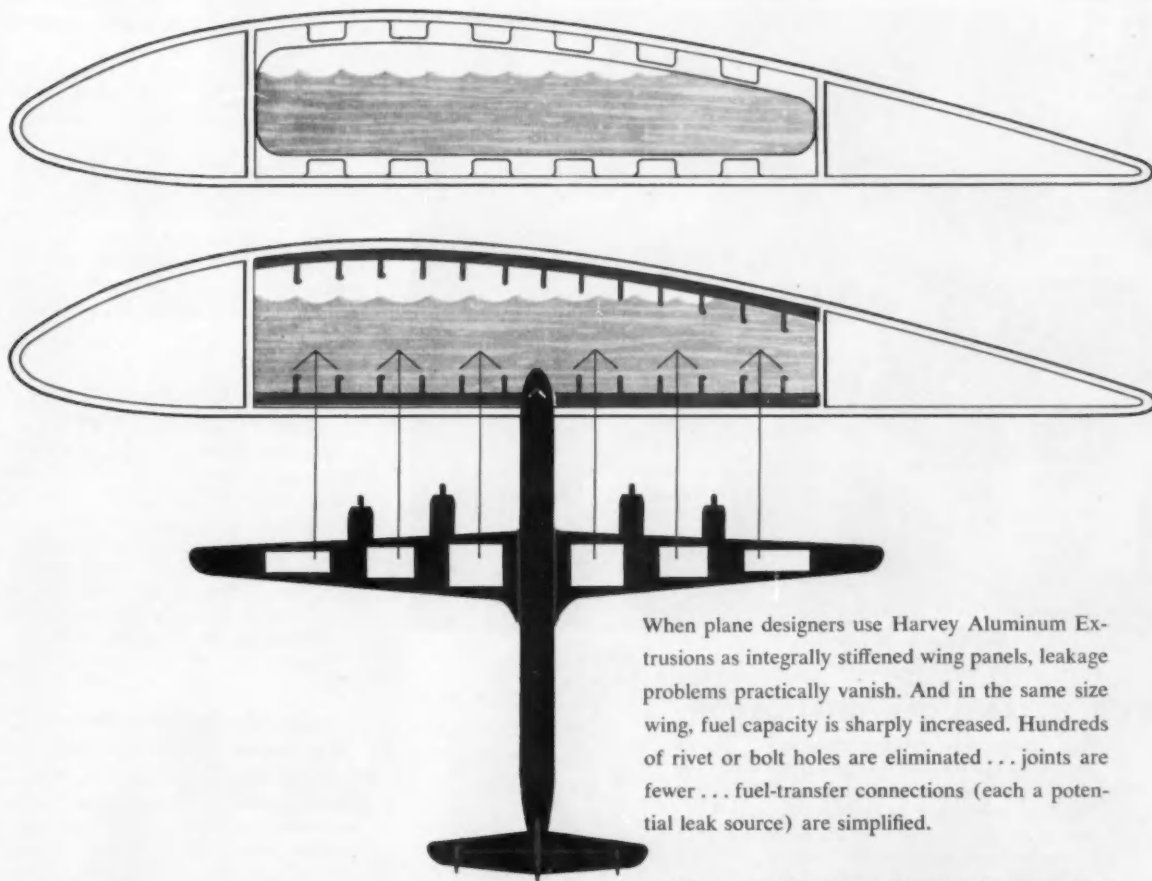
Wesson Co. is expanding its Canadian operations with the opening of a new division in Toronto, Ont.

\* \* \*

Volkswagen Canada, Ltd., has opened a \$1 million spare parts plant and office headquarters at Toronto . . . A. V. Roe Canada, Ltd., has bought control of Canadian Car & Foundry Co., Ltd.

Harvey extrusions...  
for safer flight,  
greater fuel capacity,  
simpler construction

Fuel leakage in aircraft wing tanks *must* be eliminated at all costs... it's one of flying's greatest dangers. Manufacturers once had to resort to elaborate sealing procedures around every joint and rivet. But even then, normal flight operations and wing flexing would eventually cause leaks, and locating them was a giant-sized maintenance headache.



When plane designers use Harvey Aluminum Extrusions as integrally stiffened wing panels, leakage problems practically vanish. And in the same size wing, fuel capacity is sharply increased. Hundreds of rivet or bolt holes are eliminated... joints are fewer... fuel-transfer connections (each a potential leak source) are simplified.

*Harvey is a leading independent producer of aluminum extrusions in all alloys and all sizes, special extrusions, press forgings, hollow sections, structurals, rod and bar, forging stock, pipe, tube, impact extrusions, aluminum screw machine products and related products. Also similar products in alloy steel and titanium on application.*

MAKING THE MOST OF ALUMINUM... FOR EVERYONE

**HARVEY**  
**Aluminum**

HARVEY ALUMINUM SALES, INC., TORRANCE, CALIFORNIA—BRANCH OFFICES IN PRINCIPAL CITIES

# Industry News

(Continued from page 106)

## Willys Rescue Vehicle Wins Approval for Civil Defense

A new Jeep light duty rescue truck, developed by Willys Motors in co-operation with the Federal Civil Defense Administration, has been standardized for purchase by state and local civil defense agencies with matching federal funds.

The vehicle is basically the Willys panel truck adapted to carry a wide range of emergency and rescue equipment. It has four-wheel drive to enable it to travel both on and off the road and in devastated areas such as encountered in a major disaster.

The light vehicle carries emergency equipment ranging from roof-mounted extension ladders and stretchers to five-gallon auxiliary gasoline "jerry cans" mounted on the side panels of the cowl. It has a front-mounted, 6000-pound capacity winch operated from a power take-off.

## Traffic Safety Conferences Get Off to Promising Start

The nation-wide campaign of the President's Committee for Traffic Safety got off to a successful start May 1-2, when the first of four regional conferences was held at Atlantic City, N. J. In attendance were over 1000 citizen leaders and public officials from 11 Eastern States and the District of Columbia.

The next three conferences are scheduled as follows: Southern Region—May 14-15 at Miami Beach, Fla.; Mid-Western Region—May 23-24 at Chicago; and Western Region—May 31-June 1 at San Francisco.

Primary purpose of the conferences is to develop citizen-support groups at state and local levels with traffic accident reduction as the goal. Harlow H. Curtice, GM president, is chairman of the President's Committee.

It is recognized that a serious situation now exists with traffic accidents increasing at an alarming rate. In 1955, the toll amounted to 38,300 persons killed, approximately 1.35 million injured, and a \$4.7 billion economic loss—the worst in 14 years. A recent survey showed that of the 242 U. S. cities with populations of over 50,000 persons, over half of them still have no traffic safety organization.

## New Enamel Finish Now Used By Dodge

Dodge has replaced all of its exterior automobile paints with a new enamel finish which is said to retain its original luster nearly twice as long as previous finishes. Other advantages of the paint, which has a coconut oil base, are said to be greater resistance to minor abrasions and better adhesive quality.

## Closer Tie Between Machine And Product Design Forecast

In the future the men who design products and those who design the machines for building them will work together much closer than ever before. Thus, efficiency of both plant and product will be improved greatly.

The foregoing prediction comes from Carl J. Demrick, Plymouth vice-president in charge of manufacturing. Mr. Demrick noted that closer relationships between the two groups was one of the guiding principles in building the division's new engine plant in Detroit.

(Turn to page 152, please)

## Depend on EUREKA RADIATORS for RUGGED ENDURANCE & MAXIMUM COOLING

**HONEYCOMB V-CELL TYPE**

**DIAMOND TYPE**

**TUBULAR "N" TYPE**  
3/32" x 3/4"  
Tubes on 5/8" Centers

**TUBULAR "E" TYPE**  
3/32" x 3/4"  
Tubes on 7/16" Centers

**EUREKA**

## OVER 30 YEARS OF SPECIALIZATION

For over 30 years, EUREKA Cores and Radiators have served the automotive industry with utmost dependability. Our facilities, equipment, and personnel are available for your needs. We welcome the opportunity of integrating our specialized skills with your needs to help you achieve a well-planned production schedule.

What are your requirements? We can build Radiators to your order in any type, to any size or shape. Send us your blueprints for prompt quotations!



## EUREKA RADIATORS AND CORES

for CARS, TRUCKS, TRACTORS and SPECIAL APPLICATIONS.

## AUTO RADIATOR Manufacturing Co.

Guaranteed Radiator Cores Since 1915  
2901-17 INDIANA AVE. CHICAGO 16, ILLINOIS

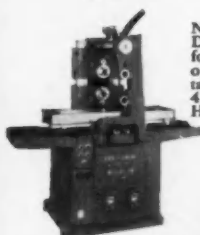


# NEW

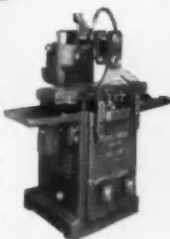


No. 3-36 . . . 36" table travel  
 . . . 64" x 16" table . . . full  
 automatic hydraulic feed.

**Simple . . .  
 Rugged . . . Efficient**



No. 1-14 . . . 14" table travel  
 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.



No. 1-M . . . Hand feed to table and head . . . 25" x 9" table . . . 12" table travel . . . head counter-balance is adjustable.



No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

## No. 3-36

### HYDRAULIC MILLING MACHINE

Now—the family of Kent-Owens Milling Machines has expanded to give you the same unexcelled milling accuracy, speed and dependability for *larger size work!*

Proudly we present the No. 3-36 Hydraulic Milling Machine . . . the new "big brother" in the line of popular Kent-Owens Millers. Each Kent-Owens machine is ruggedly designed with advanced features throughout for greater dependability and accuracy to maintain tough production schedules. Write for bulletin 955 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines.

Kent-Owens Machine Co., Toledo, O.

*Call on*

# KENT-OWENS

## for MILLING MACHINES

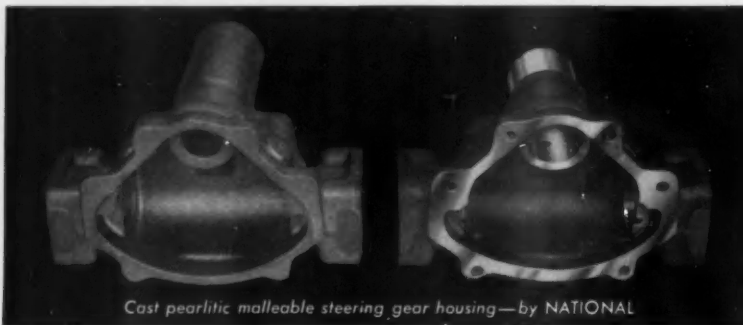
### KENT-OWENS REPRESENTATIVES

BIRMINGHAM Graham Machine Company	BOSTON Dorland Machine Works Co.	CHICAGO Four Rivers Machine Company	DALLAS Harris Machine Tool Co.	DAYTON C. H. Goodrich Machine Co.	DETROIT A. C. Harrison Machine Co.	FT. WORTH Cott Machine Co.	GRAND RAPIDS Newman Machine	HAMILTON, ONT. E. J. Barker Machine Company	HARTFORD Hartford Machine Works, Inc.	HEMLOCK Oliver H. Van Horn Co., Inc.	INDIANAPOLIS Oliver Machine Co.	KANSAS CITY Dorland Machine Co.	LOS ANGELES Barker Machine Co.	MINNEAPOLIS The Vanmeter Company	MINNEAPOLIS John J. Sweeney Co.	MINNEAPOLIS E. J. Barker Machine Co.	NEW ORLEANS Oliver H. Van Horn Co., Inc.	NEW YORK Hartford Machine Works, Inc.	PHILADELPHIA Cott Machine Company	PITTSBURGH Dorland Machine Works, Inc.	SACRAMENTO K.W. Schuler Machine Co.	SAN FRANCISCO C. E. Baker Machine Co.	SEASIDE Wm. Schuler Machine Co.	ST. LOUIS J. E. Oliver Machine Co.	TORONTO, ONT. E. J. Barker Machine Company	WINNIPEG, ONT. E. J. Barker Machine Company
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The rougher the service,  
the greater the need for

## PEARLITIC MALLEABLE CASTINGS



Cast pearlitic malleable steering gear housing—by NATIONAL

In mines and quarries... on the big construction jobs—that's where trucks take the worst beating. And that's also why many off-highway truck manufacturers have turned to pearlitic malleable castings—by National—for heavy duty parts. For truck builders know that pearlitic malleable has high ultimate strength... resists wear and fatigue under heavy loads and impacts.

And there are lots of other "plus" advantages

in pearlitic malleable castings—from National. For example, they possess excellent non-seizing properties... can be either liquid or air-quenched... can be given a smooth finish. Perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90 (B1112 steel=100).*

Pearlitic malleable castings—from National—can often reduce manufacturing costs, weight and assembly time... can increase quality and sales potential of *your* product.

**NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY**

Cleveland 6, Ohio

*The nation's largest independent producer of malleable and pearlitic malleable*

## Industry News

(Continued from page 150)

### AMC May Move Export Business To Canadian Plant in Toronto

Transfer of the bulk of American Motors export business to Toronto, Canada, is now under serious consideration. AMC now exports nearly all of its cars from its main plant in Kenosha, Wis. These amount to between 7000 and 8000 units a year.

Objective is to have the change take effect for the 1957 model year, so a decision is expected by the end of July. One of the principal reasons for exporting from Canada would be to take advantage of Canadian tariff preferentials in British Commonwealth nations.

### Ford to Sponsor Engineering Forum For Educators In June

Ford Motor Co. is applying a new twist to its program for recruiting engineers. In addition to sending out "scouts" to comb college campuses for engineering candidates, the company this year is inviting 50 prominent engineering educators from 25 schools to have a look at its engineering facilities and activities.

The educators have been invited to attend a week-long "Engineering Forum" from June 17 to 23 in Dearborn. The program is aimed basically at discussing the present critical shortage of engineers and what industry and schools can do jointly to alleviate it. Ford hopes, however, that the educators will return to their campuses with some favorable comments about the company.

### MAN Engine Now Under Test For Military Applications

Interest has been generated in Detroit in a recent report on the testing of so-called "whisper" engines (based on the MAN combustion system) by the Detroit Tank-Automotive Center. It has been confirmed that such tests are underway.

A number of conventional 170-hp truck engines are reportedly being converted to the MAN system and will be installed in military trucks. One standard medium-tank gasoline engine is being similarly converted, it is stated.

The engines are being prepared for installation by a well-known commercial engine builder licensed by MAN. Basic principles of the MAN system were outlined in the Aug. 15, 1954 issue of AI.

(Turn to page 156, please)

# **McKay's** *Flex-Roll Processor*

Conditions steel prior to  
fabricating to eliminate stretcher  
strain, minimize tearing

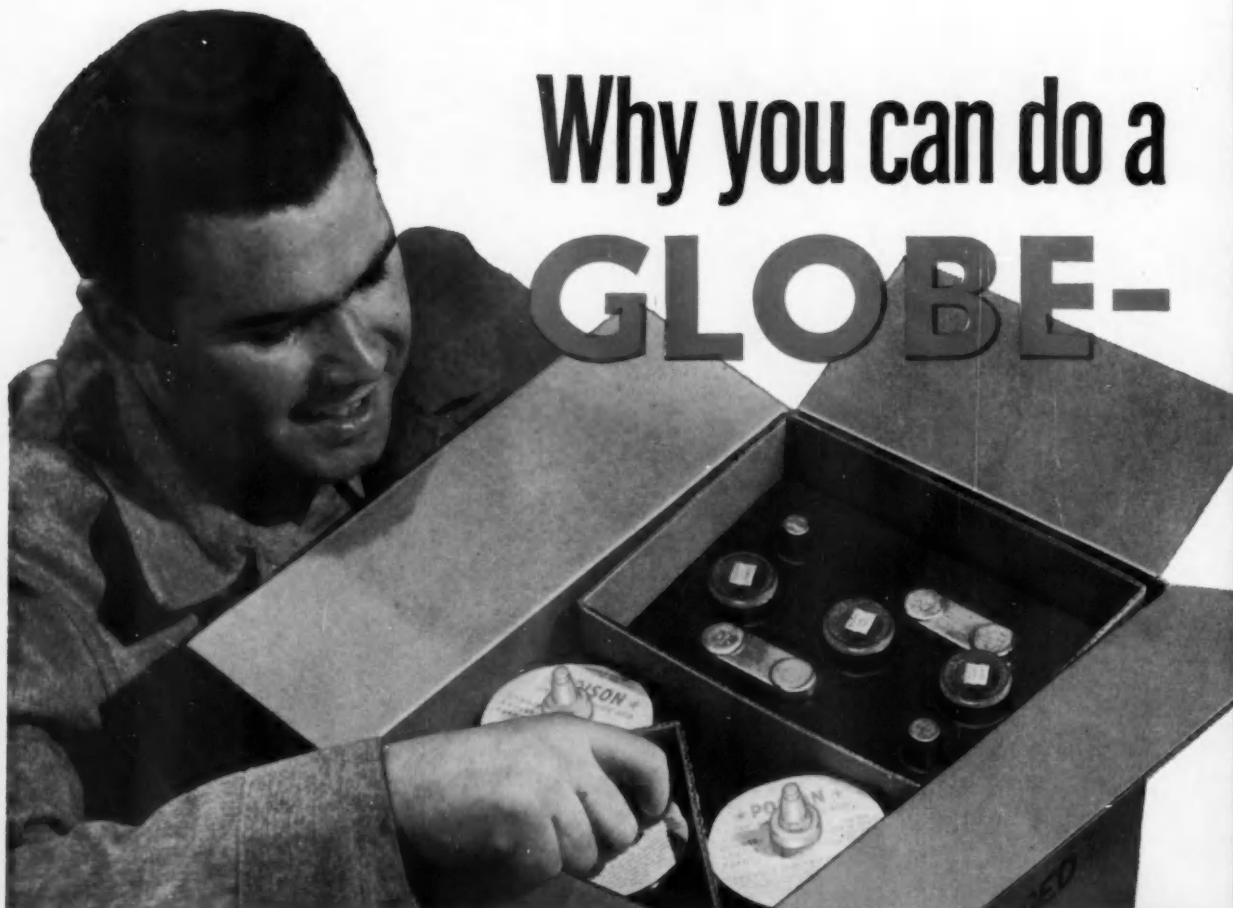


THE NATION'S foremost metal fabricators, including all the leading automotive manufacturers, have proved the McKay Flex-Roll Processor to be the finest equipment of its kind available to industry today.

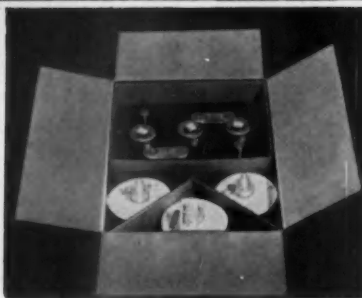
If you are doing any amount of deep drawing, you cannot afford to be without the services of this amazing unit. Let our sales engineers put you in contact with a user in your area... a few minutes of your time will convince you of its value. **The McKay Machine Company, Youngstown, Ohio.**

SETTING THE STANDARDS OF QUALITY IN METAL WORKING MACHINES FOR TWO GENERATIONS

# Why you can do a GLOBE-



**MERCHANDISING DISPLAYS THAT SELL** — Cartons for Globe dry-charged batteries have plenty of eye appeal . . . lend themselves to striking displays. Even the most casual store or station traffic is "stopped" . . . get a friendly but insistent reminder that it's time to have his battery checked.



**ONE COMPACT, "ALL-ITEM" CARTON** — When a Globe dry-charged battery is delivered, one carton contains "the whole ball of wax" — battery, electrolyte containers and safety sleeve for handling electrolyte bottles. There's no need to cross-check inventory . . . look up various items in different storage areas.



**STRONG, BUT LIGHTWEIGHT ACID BOTTLES** — Much lighter in weight than glass bottles, Globe plastic containers have greater shock or impact resistance. There's little if any chance for them to break. And they cost less to ship . . . are easier to handle and pour than most other types of disposable containers.

13 of Globe-Union's strategically-located battery plants assure fast, efficient, low-cost delivery of dry-charged batteries.

Atlanta, Ga.  
Dallas, Texas  
Emporia, Kansas  
Houston, Texas  
Louisville, Ky.  
Medford, Mass.

Memphis, Tenn.  
Milwaukee, Wis.  
Mineral Ridge, Ohio  
Philadelphia, Pa.  
Reidsville, N. Carolina  
San Jose, Calif.  
Hastings-on Hudson, N. Y.





# better merchandising job with **BUILT** dry-charged batteries!

***Today's newest, finest dry-charged batteries are a better buy for both you and your customers...***

Now from Globe-Union — makers of the world's finest and most dependable batteries — here's a "dry-charged" that's as easy to activate as it is to sell!

Naturally — this new line of batteries helps you carry a complete inventory... a battery

to meet the needs of any petroleum-powered automotive or farm equipment.

But more than that—NEW GLOBE-UNION DRY-CHARGED BATTERIES OFFER YOU EASE OF HANDLING AND STOCKING THAT'S UNMATCHED BY ANY OTHER BATTERY PACKAGE!

*Creative Packaging*

...sparks sales  
...makes activation safe  
...easy...quick



**PRE-MEASURED, READY-TO-POUR ELECTROLYTE**  
Electrolyte for Globe dry-charged batteries is closely controlled for exact specific gravity. Also, metered filling of bottles insures the correct amount for each battery. Merely cut off spout at line indicated and bottle is ready to use.



**SAFE AND EASY TO HANDLE** — Though caution is urged, Globe's practice of including an acid bottle handling sleeve in each carton lessens chance for spillage and damage. As a reminder, activation instructions are also printed on each sleeve.



**NO NEED TO STORE OR RE-FILL BOTTLES** — Globe plastic containers for electrolyte are disposable. Merely rinse out and destroy. There's no re-filling, no empties to store, no chance for old acid bottles to be mistakenly used for other purposes.

Wherever you are, there's a Globe battery plant nearby. You're assured of prompt help with any battery problems... quick, inexpensive delivery on battery shipments. Plants circled are those equipped for dry-charged battery production.

Globe dry-charged batteries are now available! The way they're built, the way they're packaged is further demonstration of Globe-Union's dynamic and creative engineering. For complete details, contact your Globe sales representative or write direct.

## GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

**if it's petroleum-powered, there's a GLOBE-BUILT BATTERY right from the start**

# ORCHARD VPI



prevents rust

on

Borg-Warner



## SHIPMENTS TO EUROPE



Borg-Warner International Corporation, Chicago, Illinois, ships transmissions to Europe for use in Mercedes-Benz, Jaguar, and other foreign cars. Wrapping and packaging for overseas shipments is done in the four simple steps illustrated. The use of Orchard VPI paper prevents rust and corrosion, and helps provide the complete protection that keeps Borg-Warner transmissions in perfect condition for two years or more.

Orchard VPI paper is scientifically manufactured to give off an invisible vapor that prevents rust on all ferrous metal parts and products. It is economical and easy to use for packaging, for shipping, and for storage. It saves time and delivers parts in a rust-free condition ready for resale or installation. Orchard VPI is available in sheets, rolls, bags and shrouds—all shapes and sizes to fit your needs.

This four-step packaging for Borg-Warner Shipment was designed, engineered, and performed by Jerome F. Gould Corporation, export packers of Brooklyn, New York and Detroit, Michigan. VPI paper was purchased through Mid-West Paper Products Company, Detroit. Mid-West Representatives: R. M. Reutlinger & Assoc., Dayton, Ohio; Protective Packaging Co., Chicago, Illinois.


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## Industry News

(Continued from page 152)

### More Use of Stainless Steel In Aircraft Is Seen Likely

Fifty per cent or more of tomorrow's supersonic planes will consist of stainless steel, Republic Steel Corp. predicts. The aircraft industry consumed 22,379 tons of the shiny metal last year.

Inside tomorrow's aircraft, say Republic metallurgists, stainless will be found not only in the interior equipment, but also in the jet engines. Future planes may be rocketed along by jet units containing 50 per cent or more stainless steel. One jet engine in production even now has better than 1000 lb of stainless in its main section, and another 600 lb in the afterburner.

For these high-heat uses, Type 410 stainless is being recommended where temperatures run to 800 F. For higher temperatures, up to 1400 F, Types 321 or 347 are being specified. Above 1400 F, Type 310 joins the list.

Among the present-day plane's stainless members, probably the smallest is a tiny needle bearing for moving parts of instruments up forward in the pilot's compartment. Lavatory and galley equipment are being made of stainless quite extensively.

In power plants, stainless parts include fire walls, heating units, and exhaust collector rings. Some of the miscellaneous uses are parts for deicing equipment, control members, and major structural parts of landing gear.

### Continental Aviation Gets \$5 Million Air Force Order

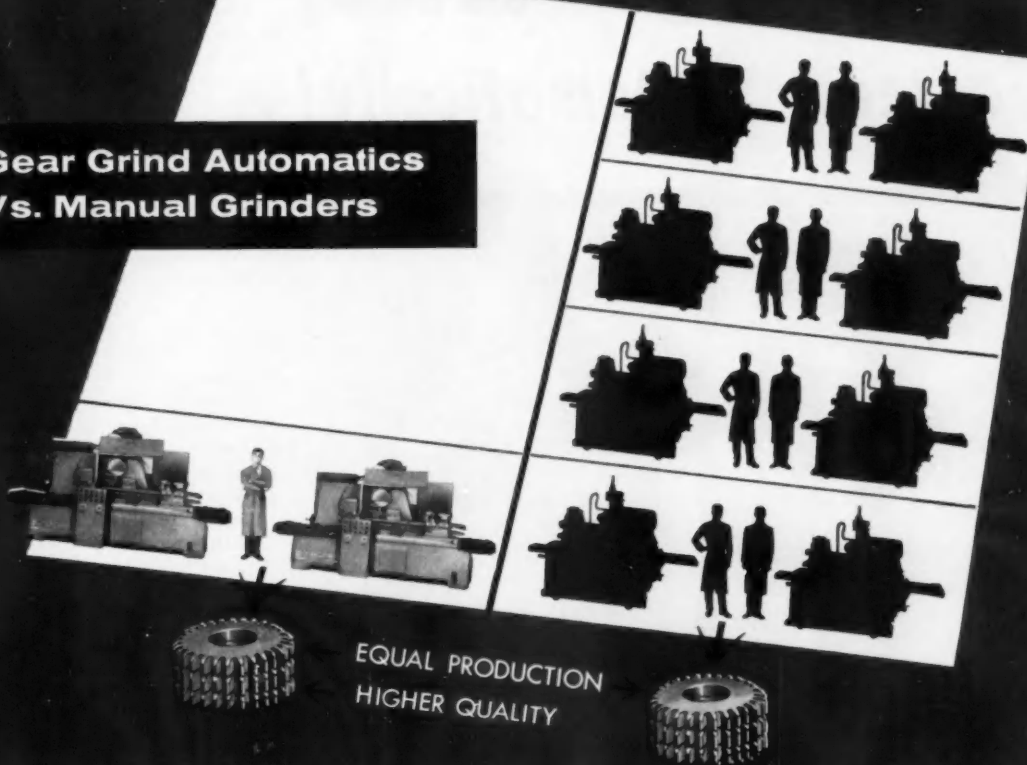
A \$5.12 million contract for production of MA-1A portable starters for large jet aircraft has been awarded to Continental Aviation and Engineering Corp. by the Air Force. It is the third Air Force production contract the company has received in the past several months to bring its total of such orders to more than \$17 million.

### GM Closes Motorama With Record Crowds

The General Motors Motorama wound up its five-city tour on April 29 with a record attendance of more than 2.2 million persons. Total attendance of 572,929 in Los Angeles exceeded that of any other city.

# Here's real grinding economy!

## Gear Grind Automatics Vs. Manual Grinders



**2 Automatics with 1 Operator Equals  
8 Manuals with 8 Skilled Operators**

$\frac{1}{4}$  the floor space  
 $\frac{1}{4}$  the number of machines  
 $\frac{1}{8}$  the manpower

} Gear  
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Economy

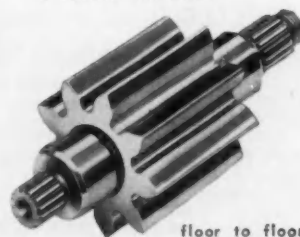


**GEARGRIND**  
*Detroit*



**PUMP  
ROTORS**  
580 pcs./8 hrs./ma-  
chine

**PUMP GEAR**



floor to floor  
grinding cycle—  
6 minutes

For all the facts—write today!

**THE GEAR GRINDING MACHINE COMPANY**

3903 Christopher, Detroit 11, Michigan

Manufacturers of:

The Detroit Screwmatic 750, Automatic Screw Machine.  
RZEPPA ("Sheppa") Constant Velocity Universal Joints

# T-J

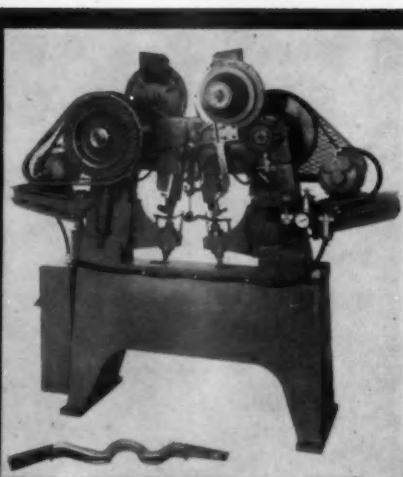
does your riveting  
and clinching

## Faster... Automatically!



T-J Clinchors adaptable to a wide range of clinch nut setting problems. Gravity feed model shown here.

### CLINCHORS



This T-J Special Dual Rivitor sets two rivets at a time... consists of two 8" throat Model R Rivitors, each with 10" hopper, special oversize anvil post, and special horn. Sample of work shown below machine.

### RIVITORS

*Automatic feeding and setting with T-J Rivitors and Clinchors help you reduce labor and step up SPEED in a wide range of assembly jobs for aircraft, automotive, farm machinery, stampings of all kinds.*

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to 7/8" long. Air-powered sets aluminum alloy rivets or steel rivets up to 3/4" long. Throat depths 8" to 36".

Write for Clinchor bulletin 555; Rivitor bulletins 646 and 555.  
The Tomkins-Johnson Co., Jackson, Mich.

T-J

**TOMKINS-JOHNSON**

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

39 Years Experience

## AIRBRIEFS

(Continued from page 96)

in the F-102A; it plans to use 18 such parts in the new and faster version, the F-102B. The press parts were made for Convair by the Wyman-Gordon Co.

### Bomarc Missile Scheduled

The new Bomarc IM 99 guided missile, which is designed to intercept enemy aircraft, is scheduled for manufacture at the Boeing Airplane Company's Wichita, Kansas plant.

Power for the IM-99 is provided by a special jet engine which has been under development at Marquardt Aircraft Co., Van Nuys, Calif., during the past several years. It has been thoroughly ground tested in the Air Force-sponsored Marquardt Jet Laboratory at Van Nuys. Details of the missile performance and engine characteristics are bound by security regulations.

### Versatile Cargo Carrier

The new F-1 Safari is a four-engined airplane designed primarily to meet the specialized requirements of short and medium haul transport and cargo operations. Additionally, it can be readily equipped as an executive airplane with luxurious accommodations for extended flights.

Designed by the recently formed Frye Corp. in Fort Worth, Texas, the F-1 Safari is planned for economical operation from small unsurfaced airstrips. Cruising speed will be about 170 mph. As a cargo carrier it will carry 8000 lb on a 1000 mile flight. In the passenger version, the plane will seat up to 51 persons and include a special picture-window lounge in the nose.

Jack Frye, who has long been associated with air transportation and commercial operations, guided the development of the Safari.

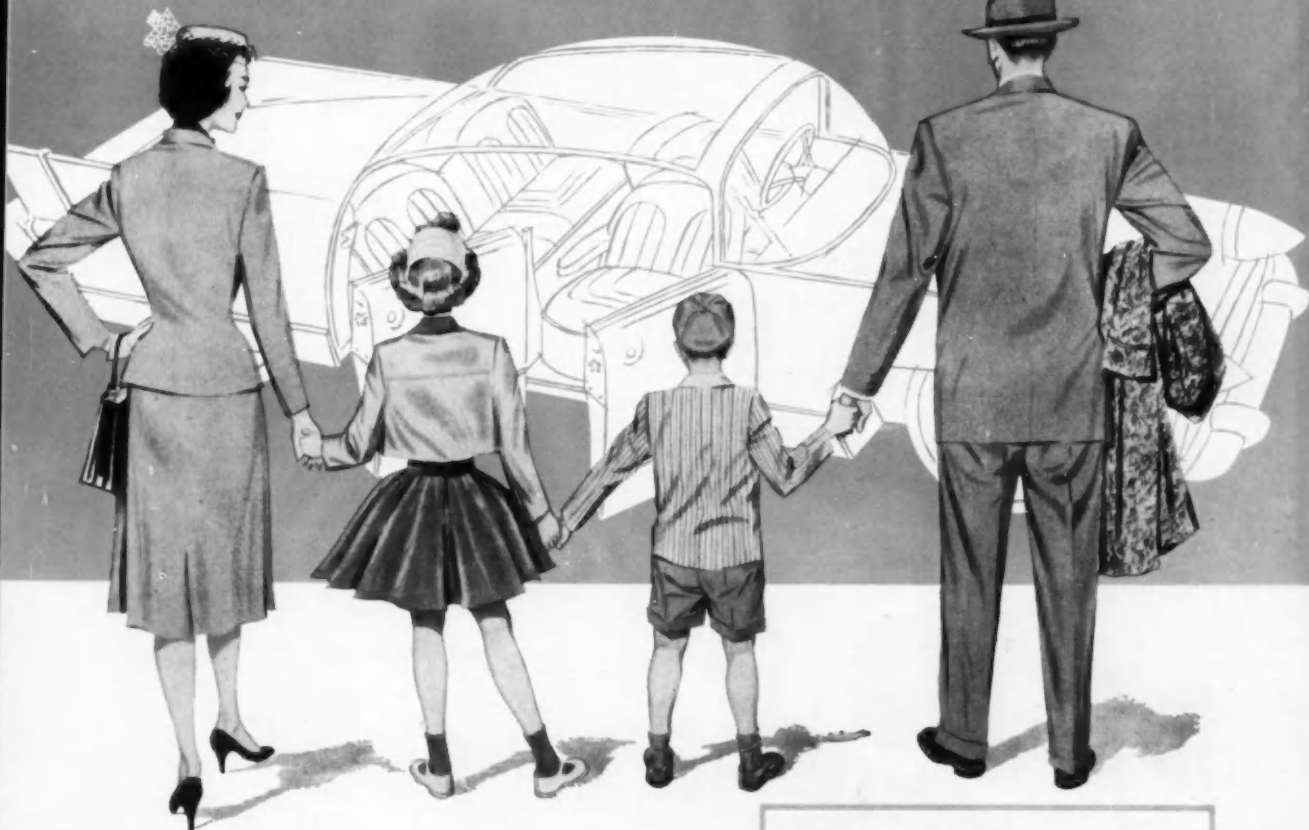
### Commercial Jet Engines

General Electric Co. plans to produce the CJ-805 commercial version of the proved GE-J79 jet engine at its Evendale, Ohio plant. Four of the powerful CJ-805 engines will be used in the Skylark 600 the medium range high-speed jet airliner being developed by Convair.

G. E. has been building jet engines since 1941. Some models of the com-



# "Give us your best"



This is the American Family that's always wanting more car for its money . . . ever new improvements in performance, styling, safety and value . . . and is getting it. Give this luxury-demanding, convenience-conscious, beauty-responsive, value-informed American Family what it looks for in a car . . . and you switch it from buying "next year" to now.

Borg-Warner has been serving the automotive industry and helping to give the American Family more for its money for over half a century. During all this time, "design it better—make it better" has been a guiding principle. And because of that principle, B-W engineering and production have become a recognized and traditional part of automotive progress.

Today, 22 of the 32 Borg-Warner divisions and subsidiaries serve the industry. 19 of the 20 cars made incorporate one or more essential parts engineered and produced by Borg-Warner. This long-time record of cooperative accomplishment ideally prepares B-W for the challenge of the future.



## BORG-WARNER

THESE UNITS FORM BORG-WARNER, Executive Office, 310 S. Michigan Ave., Chicago.

**DIVISIONS:** ATKINS SAW • BORG & BECK • BYRON-JACKSON • CALUMET STEEL • DETROIT GEAR • FRANKLIN STEEL  
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LONG MANUFACTURING • MARBON CHEMICAL • MARVEL SCHEBLER PRODUCTS • MECHANICS UNIVERSAL JOINT • MORSE • PESCO  
PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WIGWAG DIVISION  
**SUBSIDIARIES:** B-W ACCEPTANCE CORP. • BORG-WARNER INTERNATIONAL • BORG-WARNER, LTD. • BORG-WARNER SERVICE  
PARTS • LONG MFG. LTD. • MORSE CHAIN • MORSE CHAIN OF CANADA, LTD. • REFLECTAL CORP. • WARNER GEAR, LTD.  
WESTON HYDRAULICS, LTD.

**In 1900**—The old time mixing valve was replaced by MARVEL CARBURETORS.

**In 1903**—The Spur type Differential was introduced by WARNER GEAR. Radiators made of copper tubing with attached cooling fins introduced by LONG.

**In 1913**—The Single Plate Clutch was developed by BORG & BECK and Silent Timing Chains were introduced by MORSE CHAIN.

**In 1916**—Universal Joints were developed by MECHANICS.

**In 1921**—First standard type Transmissions were introduced by WARNER GEAR.

**In 1922**—Double Plate Clutches were introduced by LONG.

**In 1923**—Multiple Spring Clutches developed by ROCKFORD.

**In 1924**—Vibration Dampening Flexible Center Clutches introduced by BORG & BECK.

**In 1930**—Transmission Synchronizer Units for cars and trucks produced by WARNER GEAR.

**In 1931**—Roller Bearing Universal Joints introduced by MECHANICS. Free Wheeling offered to the industry by WARNER GEAR. Tapered Steel Discs for truck wheels were developed by INGERSOLL.

**In 1934**—Automatic Overdrives for transmissions were introduced by WARNER GEAR.

**In 1938**—Borglite and Torbend Clutch Plates were introduced by BORG & BECK, LONG, and ROCKFORD.

**In 1939**—Ty-Ply Rubber-to-Metal Bonding material developed by MARBON.

**In 1949**—Automatic Transmissions for passenger cars perfected by DETROIT GEAR and WARNER GEAR.

**In 1952**—MARVEL SCHEBLER introduced Power Chambers and Hydraulic Power Units for trucks and trailers; LPG Carburetion Systems for trucks, tractors, buses, taxis and stationary engines.

**In 1953**—Automatic Transmissions for trucks produced by WARNER GEAR and DETROIT GEAR.

**In 1955**—Morlife Clutches for trucks, buses, and other heavy duty equipment introduced by ROCKFORD.

# NEW SENECA FALLS AUTOMATIC

pany's J47 jet engine are now allowed 1400 hours of flying time between overhauls (equivalent time for 30 jet flights around the world). This expanded flight time is a great step forward from the 200 to 250 hours allowance for early jet engines.

## Air Transport Growth Charted

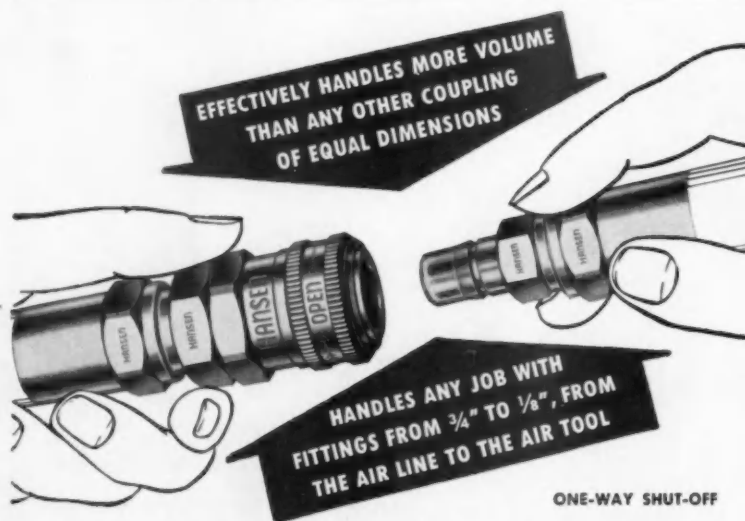
Since 1946, the air transport industry in the U. S. has grown over four times in size, with total revenues of \$1,610,577,000 for 1955. These and many other interesting facts are

available in the 17th edition of "Air Transport Facts and Figures," published by the Air Transport Association, 1107 Sixteenth St., Washington 6, D. C.

## Bomber Comparison

Here is an interesting comparison recently noted in *Planes*, an official publication of the Aircraft Industries Association:

	World War II Bomber	Today's Heavy Bomber
Gross weight	66,000 lb	Over 350,000 lb
Top speed	350 mph	Over 650 mph
Horsepower	4800	135,000
No. detail parts	30,000	100,000
Mfg. tolerances	1/32	1/500
Miles of wiring	5	60
No. of crew	10	5
Engineering man-hours to first production flight	558,000	7,415,000
Cost per plane in initial production phase	\$300,000	\$4,000,000



## HANSEN Series 3-RL RING-LOCK COUPLING

Smaller—lighter—compactly designed, the Hansen Series 3-RL Coupling effectively handles far more volume than any coupling of equal dimensions. On any job requiring  $\frac{3}{4}$ " to  $\frac{1}{8}$ " connections—from the air line to the air tool—this single size Hansen Ring-Lock Coupling—with completely interchangeable Sockets and Plugs—does it all—makes it easy to keep stock of parts in balance—holds inventories to a minimum.

To connect, merely push Plug into Socket. To disconnect just turn the

sleeve. Locking ring provides positive lock and assures tight fit. Sockets with aluminum bodies are available for use with small hand-operated air tools.

Write for Descriptive Literature



SINCE 1915



QUICK CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN

MANUFACTURING COMPANY

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## Trans-Atlantic Cargo Service

Seaboard & Western Airlines, the only scheduled all-cargo airline certified by the Civil Aeronautics Board, inaugurated its operations on April 11th with a 3900-mile flight by one of its Super Constellation freighters. The airplane delivered a record 32,000 lb of cargo from New York to Frankfurt, Germany, via Shannon and London, in an elapsed time of 19 hours and 20 minutes.

## Air Events

The National Aircraft Show will be held this year on September 1-3, at Oklahoma City, Okla. It is the only show of its kind this year with the full sanction of the Department of Defense and in which the department will participate.

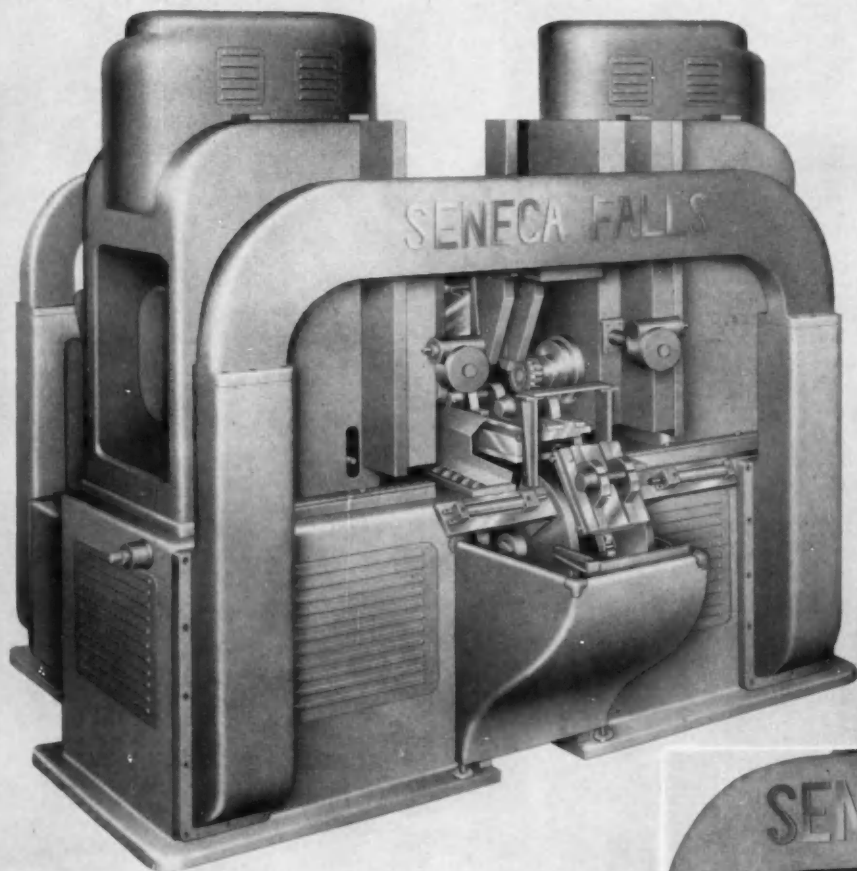
The forthcoming New York to London to Johannesburg International Air Race is sponsored by the Royal Aero Club of the United Kingdom and the Johannesburg Festival 1956 Ltd., in cooperation with the Aero Club of South Africa and the National Aeronautic Association of Washington, D. C. Prize money of £75,000 has been guaranteed. Scheduled start from Floyd Bennett Field, Brooklyn, New York, the event is planned for September 12 to 15, 1956.

## Supercharged Commander Completed

Aero Design and Engineering Co. of Bethany, Okla. has delivered its first supercharged executive aircraft to the Long Manufacturing Co., Tarboro, N. C. The new plane has a top speed of 260 mph and a service ceiling of over 25,000 ft. With one of its two engines operating, it can maintain an altitude of 15,000 ft while carrying five to seven passengers.

(Turn to page 164, please)

# NEW... SENECA FALLS AUTOMATIC TRANSFER TYPE, MILLING AND CENTERING MACHINE



◀ Front view showing milling stations. Loading and unloading of work pieces is done at this end of the machine.

● The new Seneca Falls Model MX Double End, Transfer Type, Automatic Milling and Centering Machine is designed to insure accuracy and reduce manufacturing costs on milling to length and centering operations by combining these operations on a single machine serviced by one operator.

The machine illustrated is equipped for rough and finish milling operations as well as for the centering operations. However, design is such that single, face milling heads may be supplied in combination with other type heads for end milling driving slots in the face of the work pieces or for combined drilling, reaming, boring, threading and tapping operations in one or both ends of work pieces.

Write SENECA FALLS MACHINE CO., Seneca Falls, N. Y. for Bulletin MX-D

Rear view showing centering station. Work carriers carry finished pieces thru the machine tunnel to the front station. ➡

## MODEL MX DESIGN FEATURES

- ▶ High production, multiple station, fully automatic machine.
- ▶ Standardized tool carrying heads.
- ▶ Ease of tool and cutter changing.
- ▶ Automatic in-line work transfer from station to station.
- ▶ Automatic cycle interruption in case of overload on tools.
- ▶ Automatic rapid traverse movement for all tool heads.
- ▶ Ease of loading and unloading.
- ▶ Automatic power clamping devices.
- ▶ Hardened and ground ways for work carriers.
- ▶ Motorized chip disposal.
- ▶ Simplified maintenance.
- ▶ Manual push-button operation.



## PROFIT ENGINEERED BY SENECA FALLS





TOMORROW:

## A standard motor that can survive infinite heat

The new ***Life-Line A*** is another step closer

Westinghouse is working on tomorrow's motor today. Investigating new materials—testing existing motor designs.

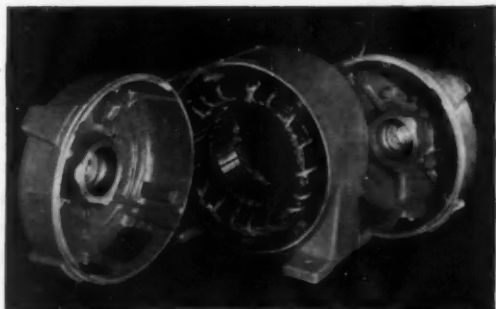
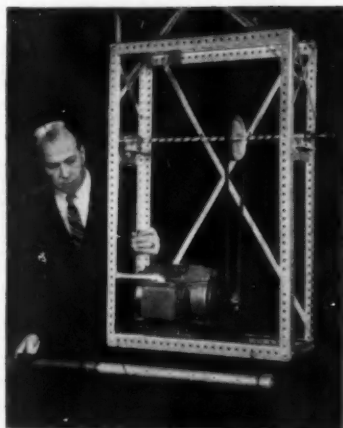
No standard motor today can survive the ultimate test shown here. But we do know that the new Life-Line® "A" can operate under higher temperatures than ever before. It has stronger insulation and better bearing protection than any other motor on the market. It's industry's closest approach to a standard motor that is absolutely heatproof.

Your Westinghouse sales engineer can show you many additional reasons why the Life-Line "A" is industry's most advanced and preferred motor. Call him today.

J-21926

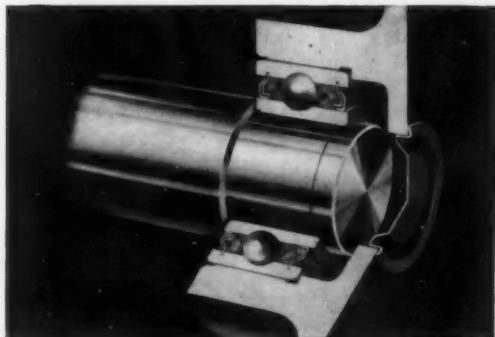
**WATCH  
WESTINGHOUSE!**

WHERE BIG THINGS ARE HAPPENING TODAY!



New fortified insulation includes exclusive Bondar, Bondite and Mylar\*—three good reasons why the Life-Line "A" is so resistant to heat or any other motor contamination.

\*DuPont Registered Trade-Mark



Two outer seals of new 4-way sealed bearing act as flingers and literally throw off damaging contaminations. Inner seals, attached to outer bearing race, are stationary and form a positive labyrinth.

## WHAT'S NEW in automatic systems



This Binks automatic spray painting system tirelessly applies a beautiful finish to the exterior of Nash and Hudson Rambler bodies. Special adaptations permit rapid color changes.

### Automatically...Rambler bodies get a perfect finish...every time

Automatic spray painting systems are the surest guarantee of consistent high quality and uniformity of product finishes... and they do the work faster... and more economically.

An excellent example is the automatic finishing system in operation at the Kenosha Assembly Plant of American Motors Corp. This system automatically applies a uniform finish to the exterior surface of Rambler bodies.

A coating of primer and either one or two color-tones are applied to each body as it passes through the Binks down-draft water wash spray booths. Tripping levers automatically activate the spray guns, as they oscillate back and forth over the body. The spray guns mounted

at the top of the booth first paint the trunk deck, then as the body moves forward, rise automatically to finish the roof. The guns again lower to coat the cowl. The system automatically compensates for variations in body styles. A similar system is also in operation in the American Motors Milwaukee plant.

#### Free engineering help.

Automatic equipment of this kind is indicative of what can be accomplished when plant operating engineers work closely with Binks engineers on a specific problem. Binks' broad experience in this field is available to you without obligation. Just contact your nearest Binks Branch Office or write direct to the address below.

2245-55

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## AIRBRIEFS

(Continued from page 160)

### Courier Airplane Improved

A 1956 model of the Helio Aircraft Corporation's Courier can now cruise at 167 mph, has a range of 745 miles with 45 minutes reserve fuel.

The Courier is a four-place utility airplane with exceptionally short take-off and landing capabilities. This spin-proof, stall-proof plane can fly less than 30 mph under full control, and is guaranteed to take-off and land fully loaded in 75 yards under no wind conditions.

Since setting up production at Pittsburg, Kan. the company has delivered 28 Couriers to a wide assortment of users. In addition to passenger transport, uses include mining and jungle operations, aerial photography, and TV coverage.

### Transistors Used in New Compass

Navy Bureau of Aeronautics has ordered production quantities of a new type aircraft gyro compass system from Lear, Inc., Grand Rapids, Mich. Designated by the Navy as Type MA-1, the instrument control circuit has silicon transistors instead of vacuum tubes, magnetic amplifiers and printed circuits to provide lightness, low power consumption and a high degree of reliability and miniaturization.

First production units are earmarked for installation in the Grumman F11F-1 supersonic Navy fighter, the Grumman UF-1 amphibian, and the Lockheed R7v-1 transport.

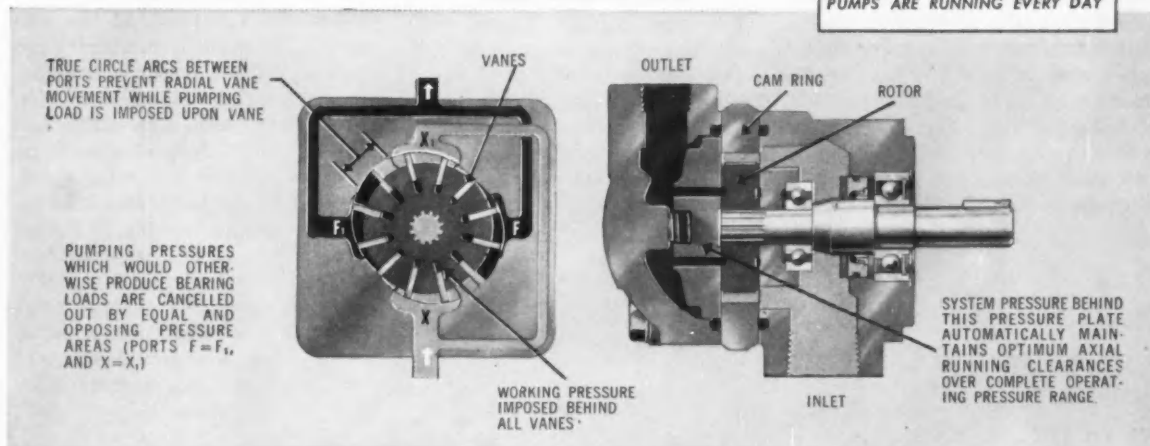
### Reinforced Plastic Sheet Standard Formally Chosen

A new standard to cover a reinforced plastic sheet laminate for mechanical and electrical applications has been adopted by the National Electrical Manufacturers Association, the American Society of Testing Materials, and The Society of the Plastics Industry, Inc. This standard covers a general-purpose grade of polyester glass-mat sheet laminates.

Specified in the new GPO-1 standard are control values for essential physical and electrical properties for a glass mat reinforced polyester plastic sheet laminate intended for use at elevated temperatures as required of Class B electrical insulation. This has been designated as a "generous-purpose" grade with the thought that it may prove to be only the first of several grades.

# Question: Why are **VICKERS** Balanced Vane Pumps the most widely used oil hydraulic power pumps on mobile equipment?

MILLIONS OF VICKERS VANE TYPE PUMPS ARE RUNNING EVERY DAY



## Answer: Because of their SUPERIOR PERFORMANCE and MANY OTHER BENEFITS for the user.

For more than two decades, the Vickers Balanced Vane Type has held the leading position among hydraulic power pumps . . . growing steadily in popularity. The various models (only a few shown below) are the most widely used of all pumps in oil hydraulic service on mobile equipment.

The many advantages listed hereafter merit the thoughtful attention of anyone concerned with the selection and use of oil hydraulic pumps for construction, automotive, agricultural and materials handling equipment.

**COMPLETE HYDRAULIC BALANCE**—Each inlet and outlet port is balanced by another equal in size and radially opposite . . . pressure-induced bearing loads are thus eliminated.

### VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION  
ADMINISTRATIVE AND ENGINEERING CENTER  
Department 1428 • Detroit 32, Michigan

Application Engineering Offices: ATLANTA • CHICAGO  
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WORCESTER  
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

**OPTIMUM RUNNING CLEARANCES**—Both radial and axial clearances are automatically maintained over complete operating pressure range and throughout pump life.

**FLOATING ROTOR DRIVE**—Rotor is free to float, for correct centering and alignment, on a rigidly supported spline.

**TRUE-CIRCLE CAM ARCS** between ports prevent radial vane movement while pumping load is imposed upon vanes. Wear between vanes and rotor is thus practically eliminated.

**EASIER COLD WEATHER STARTING**—At normal engine starting speeds vanes are retracted . . . centrifugal force is insufficient to throw vanes outward into operating position . . . thus no pumping action takes place and pump drag on starting engine or motor is nonexistent. Only after engine starts is speed sufficient to extend vanes and begin pumping.

**GREATER INSTALLATION ADAPTABILITY**—Various types of mountings and four optional positions of pressure outlet connection. By unbolting and rotating pump head, the outlet can be placed parallel, opposite to or at a right angle in either direction to inlet. Shaft drive is in either direction depending only on internal assembly. Pump can be driven by belt, chain, gear or directly coupled.

**HIGHER EFFICIENCY**—Tests prove exceptionally high volumetric and overall efficiency . . . not only when pump is new but also after long service.

**AUTOMATIC WEAR COMPENSATION**—Vaness are held in contact with the cam ring by centrifugal force and hydraulic pressure. If wear occurs, vanes revolve in a slightly larger orbit without appreciable change in performance.

**TEMPERATURE ADAPTABILITY**—Correct running clearances are automatically maintained which compensate for wide variation in oil viscosity resulting from temperature variation.

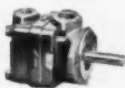
**MINIMUM MAINTENANCE**—Hydraulic balance . . . optimum running clearances . . . floating rotor drive . . . automatic wear compensation eliminate the most important causes for maintenance and repair.

**LONGER LIFE**—The numerous features mentioned above that keep down maintenance also contribute to longer life.

**COMPACT**—These pumps occupy very little space in proportion to their capacities.

**CONSTRUCTION SIMPLICITY** is evident from the illustrations above. This simplicity is another reason for the superiority of Vickers Vane Pumps. For further information, ask for Bulletin M-5101.

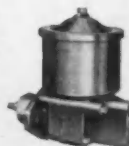
Single pump available in five basic case sizes having 15 normal delivery ratings. Operating pressures to 1500 psi (two largest units to 1000 psi).



Double pump for operating two independent hydraulic circuits from one power source. Available in 38 combinations. Operating pressures to 1500 psi (two largest units to 1000 psi).



"Package" type pump with integral volume control and relief valve, and oil reservoir; also available without oil reservoir. See Bulletin M-5107. (This pump only.)



ALL MODELS HAVE THE VICKERS ADVANTAGES MENTIONED ABOVE

7353

## Magnetic, Contactless Controls

(Continued from page 58)

cal resemblance. Major advantages are lower system cost, more compactness, and simplicity. New units are three inches high, two inches wide, and two inches deep. They are encapsulated in polyester resin and fitted with terminals on the upper and lower faces; these modules plug into a new specially designed power channel.

### Selenium Rectifiers

The new module Cypak unit makes use of a selenium rectifier containing two selenium cells. There are six logic terminals of the double-flag type on the top of the block. Components; toroids, rectifiers, resistors, and terminals are first mounted on a printed cir-

cuit board about 1/16 in. thick, and the entire assembly is dip soldered. Next, the unit is placed in a mold to get its polyester cover. Logic diagrams are molded-in on one side of the block to indicate the functions of the element. Terminal numbers and phasing dot for proper positioning appear near the signal terminals. The power strip is a preformed bus-bar with a long plug made up of a flat Micarta insulating panel, eight specially designed solid copper bus bars containing 16 female terminals each, and 16 individual spacers used to align and restrain the terminals. The channel is 24 in. long and two inches wide. Power plugs are provided for 15 logic elements and terminals for main power supply.

### Higher Production

It was brought out that although initial cost of the Cypak installation would in most cases be slightly more than for other control types, there would be a saving through higher production and lower maintenance.

One of the featured speakers during the two-day forum was Louis Polk, president of Sheffield Corp. and president of the National Machine Tool Builders' Association. Mr. Polk told the large audience that unless mechanization is accelerated, the nation's available labor force may be insufficient to turn out the future indicated volume of goods and services demanded by our constantly ascending standard of living. He based his statement on a chart, computed on an index basis, which showed the trends of total employment, physical volume of industrial production, and output of electrical energy, over the past 25 years, and projected these trends 25 years into the future. According to Mr. Polk, only a part of the employable people in the country are available for industrial production. In 1950, he pointed out, manufacturing accounted for only about one-quarter of the total. If that ratio should still hold good in 1980, it would mean that industry would have only about 22,400,000 people available to turn out the

## Hardened and Ground Parts are our Specialty

This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-27% bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2 1/2" dia., +.000 —.001.

Parts like this are our specialty—we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

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#### Experienced production on:

King Pins • Wheel Studs  
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... anything in the hardened and ground line, of any analysis steel, up to 4 1/4" diameter.



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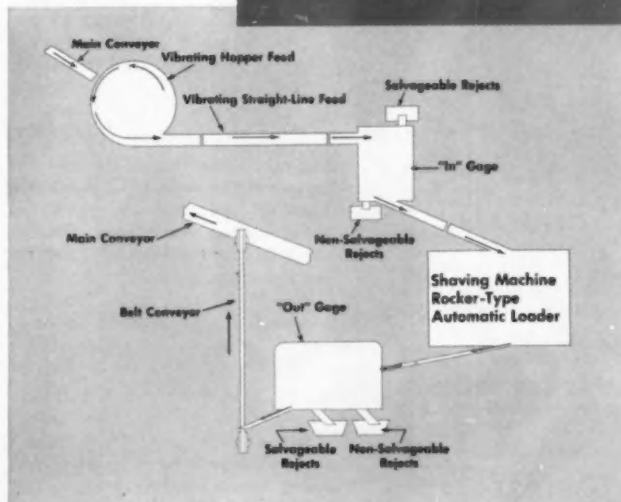
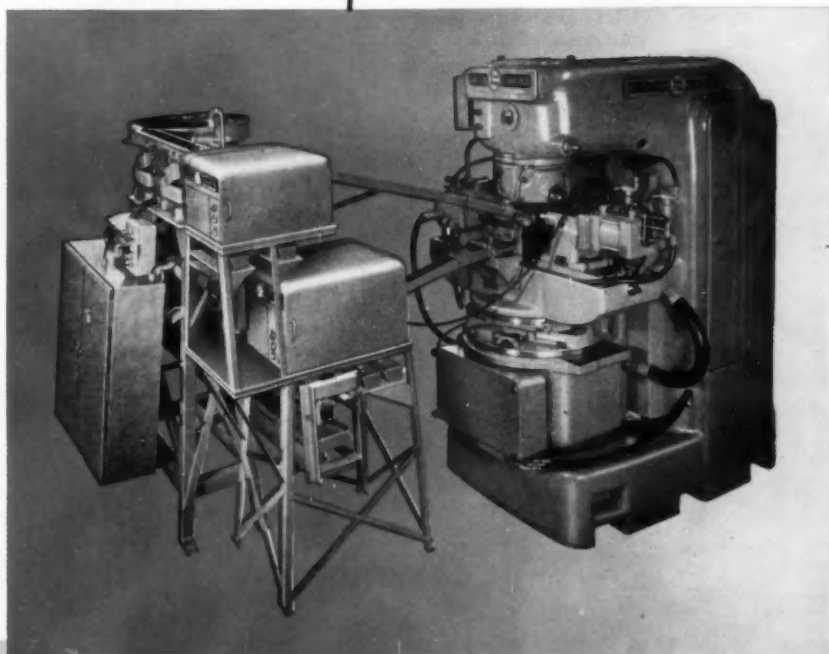
SYRACUSE, N. Y.

G. M. Eliert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 8851 N. Ashland Ave., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Lyle H. Johnson, 1388 Westwood Blvd., Los Angeles, Calif. • John S. Hunt, 8011 S.E. Yamhill St., Portland, Ore.



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# SHAVE GEARS AUTOMATICALLY



*This is fully automatic Red Ring gear finishing.*

Cut gears come in on a conveyor to the storage and feeding mechanism. This may be a vibrating hopper, overhead chute or other device.

These gears are fed into an "In Gage" which screens out undersize and greatly oversize parts, passing only those within tolerance to the Shaving Machine.

After shaving, the gears then go through the "Out Gage" where they are checked for size and helix angle—again screening out the rejects.

Whenever the percentage of rejects goes beyond a selected amount the gage shuts down the shaving machine and indicates by signal lights the nature of the difficulty.

WRITE FOR COMPLETE DETAILS



SPUR AND HELICAL GEAR SPECIALISTS  
ORIGINATORS OF ROTARY SHAVING  
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5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

7381

AUTOMOTIVE INDUSTRIES, May 15, 1956

167

incredible production total indicated by the projection of the Federal Reserve Board Index.

Following is an abstract of one of the papers presented at the forum.

## Linear Position Control for Machine Tools

By Frans Brouwer, Section Engineer  
Telecommunications Engineering Department  
Electronics Division

CANADIAN WESTINGHOUSE CO., LTD.  
Hamilton, Ontario, Canada

A NEW type of transducer recently developed by Canadian Westing-

house allows the measurement of linear displacements to accuracies of

0.0001 in. over distances of the order of several feet. This new transducer is expected to bring a new measure of simplicity and reliability to such measurements. It is evident that the device can be applied to milling machines, lathes, boring mills, jig borers, and all types of special machines in which cutting tools must be positioned with great accuracy.

The transducer consists of two parts which are electro-magnetically coupled. The primary part is a long cylindrical bar of solid insulating material or a bar coated with insulating material. In this bar two grooves are cut in the form of a two-start spiral. Wound in these spiral grooves are wires which are joined together at one end of the bar and connected to slip rings at the other, thus forming a long bifilar coil. The secondary part of the transducer is similar to the primary part. It is also a bifilar coil but is wound on the inside of a sleeve which though fitting snugly can yet slide over the primary part of the transducer.

In a typical system, a machine tool slide is driven with a lead screw from a servomotor through a gearbox. The secondary coil of the transducer is mounted on an arm on the cross carriage slide, while the primary coil is mounted in bearings so that it is free to rotate around its own axis. This axis is parallel to the direction of motion of the slide. A-c voltage is supplied to the transducer and its output after amplification is fed to the servomotor.

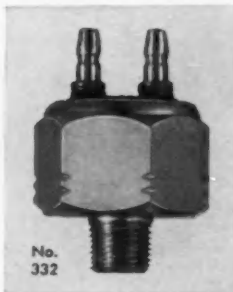
The operation of this simple positioning servo is straightforward: the motor moves the slide until it reaches the nearest position at which the transducer gives zero output. Similar null positions repeat at points that are spaced apart by distances equal to the lead of the transducer coils. Positions in between may be obtained by rotation of the primary coil of the transducer. For example, with a lead of 0.1 in., a displacement of one mil may be obtained by rotating the transducer shaft 1/100 revolution, or 3.6 degrees. To move the slide over long distances several revolutions of this shaft are necessary.

It may be observed that this system is ambiguous: for every setting of the dial many stable positions of the servo are possible. A particular arrangement eliminates this effect by using a "coarse-fine" system. The coarse system is a conventional position servo which finds the approximate position selected by the "coarse" dial. Once this position is reached, the coarse error signal is too small to hold the coarse-fine switch any longer



**Dependable . . .**  
*when dependability counts!*

**FASCO**  
**HYDRAULIC**  
**STOPLIGHT**  
**SWITCHES**



Fast-Action Stop! Caution Oncomers! That's the message the FASCO Stoplight Switch conveys from one driver to others . . . without fail! Over 140 million used since the adoption of hydraulic brakes . . . PROOF that when you design for dependability, safety and service it PAYS to

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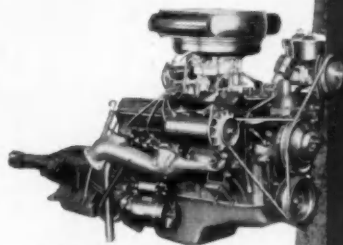
AUTOMOTIVE DIVISION

**FASCO**

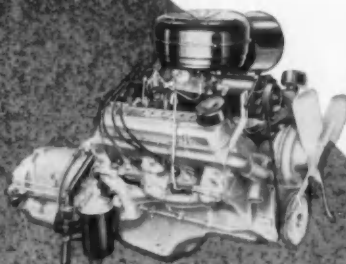
INDUSTRIES, INC.  
ROCHESTER 2, NEW YORK

DETROIT OFFICE—12737 PURITAN—PHONE: UN 17476

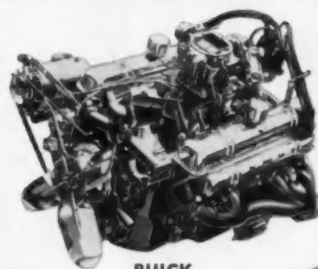
# GM POWER PARADE!



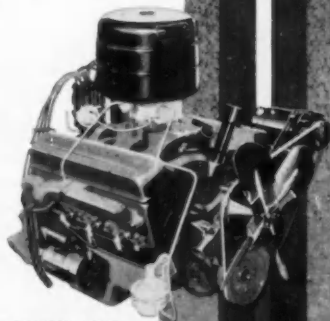
CADILLAC



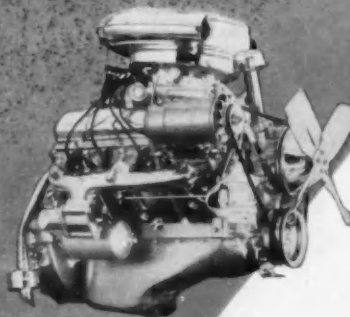
PONTIAC



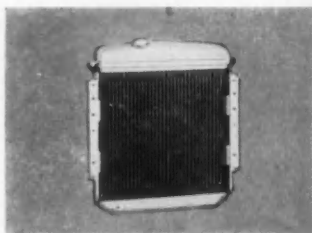
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## HARRISON COOLS THE ENGINES FOR THE FAMOUS FIVE!

High-compression, high-powered engines call for a high degree of cooling! That's why these five famous GM engines call for Harrison. For Harrison radiators can be relied on for efficient, economical performance—all-round dependability! In fact, Harrison has been first choice with leading automotive manufacturers for over 45 years . . . cooling more cars than any other builder by far! What's more, you'll find Harrison heat exchangers at work on all kinds of aviation, marine and industrial equipment. The ultra-modern engineering and research facilities at Harrison are constantly on the job . . . looking for new and better ways of doing the vital job of cooling. If you have a cooling problem, look to Harrison for the answer.

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N. Y.



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TO  
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# SHEFFIELD

## *Adjustable* AIR GAGE TOOLING for Short Runs and Emergencies

**SUCH AS:**

- Aircraft manufacturers, subcontractors and job shops having limited production.
- Accidental damage to a vitally needed single purpose gage.
- An unexpected engineering change involving part size.
- A short run of special parts for which no gages have been provided.
- A mistake or failure in ordering the needed single purpose gages.
- Sudden need for process gages at the production machines.

Don't let any of these situations cause costly scrap, delays or embarrassing confusion in inspection, in the shop or in the tool-room. A small investment in the tooling here illustrated is your best insurance against unpredictable production losses.

Write Dept. 4 for descriptive engineering data. **THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.**

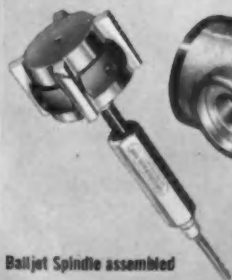


### **Economical, Adjustable Balljet Spindle Kit**

In 5 minutes you can assemble, for precision gaging, a spindle for ANY SIZE hole from 1" to 3" in diameter.

Consider economy for a moment. If the holes you may encounter vary in increments of .001", this Kit provides the equivalent of 2000 Spindles at a unit cost of less than a dollar. If those increments are .0001" you have available 20,000 Spindles at about a dime each. That is real economy.

No auxiliary equipment needed except conventional gage blocks—NOT EVEN ONE MASTER SETTING RING.



Balljet Spindle assembled



Balljet Spindle in use



Calibrating Fixture

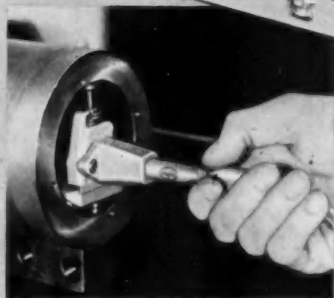


Adjustable  
Balljet Spindle  
Kit



## Adjustable Airebore Gage

Adjustable Airebore Gage



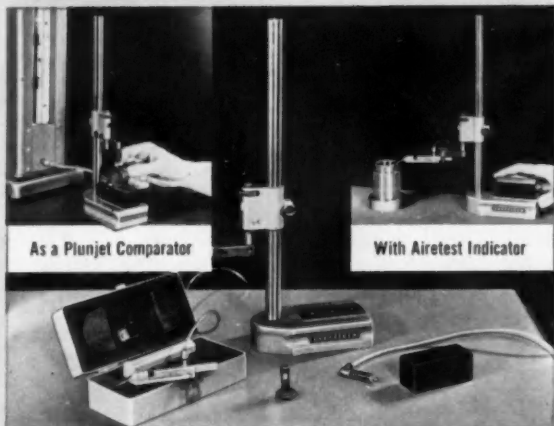
Airebore Gage assembled

Airebore Gage in use

The Airebore Gage can be set precisely to measure any diameter hole from 3" to 12". And like the Adjustable Balljet Spindle, it is set up with a calibrator and gage blocks. No master setting rings are needed.

The Airebore Gage is self-centering—needs only to be rocked in place for precision action. It is light in weight with all contact surfaces of tungsten carbide—nothing to wear out.

## Airetest and Plunjet Stand



As a Plunjet Comparator

With Airetest Indicator

A new, highly versatile stand accommodates a dial indicator or an Airetest Indicator—also converts to a comparator by using a Plunjet and anvil as illustrated.

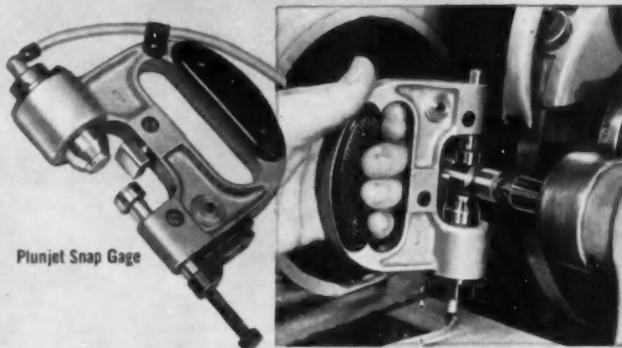
## Three-Point Adjustable Spindles



Three Point Adjustable Spindles

The Three-Point Adjustable Spindles, four of them, cover respectively the ranges,  $\frac{3}{8}$ " to  $\frac{1}{16}$ ",  $\frac{1}{16}$ " to 1",  $\frac{7}{8}$ " to 1½" and 1½" to 3". They can be set up with gage blocks.

## Plunjet Indicator Snap Gage



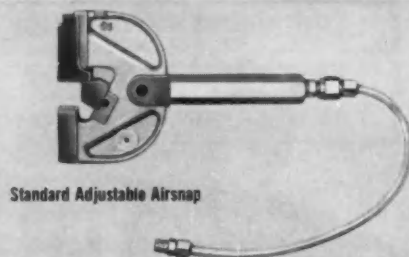
Plunjet Snap Gage

Plunjet Snap Gage in use

The Plunjet Gaging Cartridge may be substituted for the Dial Indicator to assure consistent, repetitive readings, especially when tolerances are .001" or less.

Twelve Plunjet Snap Gage models cover the gaging range of 0" to 12". Larger sizes are available on special order.

## Standard Adjustable Airsnaps



Standard Adjustable Airsnap

The Standard Adjustable Airsnap in 17 models covers the range .2500" to 5.500". Up to 3.000" the adjustable anvil has a maximum adjustment of  $\frac{1}{4}$ ". Above that the maximum is  $\frac{1}{2}$ ".



# SHEFFIELD

manufacture and measurement for mankind

- ☐ **BRUSHES** for all rotating electrical equipment (Automotive-Aviation-Industrial-Traction, etc.)
- ☐ **GRAPHITE TUBE ANODES**
- ☐ **GROUNDING RODS** for protection against rust (earth and water types)
- ☐ **NON-WELDING ELECTRICAL CONTACTS**
- ☐ **VOLTAGE REGULATOR DISCS** (carbon piles)
- ☐ **WATER HEATER and PASTEURIZATION ELECTRODES**
- ☐ **BEARINGS**
- ☐ **WELDING RODS**
- ☐ **WELDING PLATES and PASTE**
- ☐ **RESISTANCE WELDING and BRAZING TIPS**
- ☐ **MOLDS and DIES**

## "EVERYTHING IN CARBON BUT DIAMONDS!"

- ☐ **SPECTROGRAPHITE**
- ☐ **POROUS CARBON**
- ☐ **SEAL RINGS**
- ☐ **FRICTION SEGMENTS**
- ☐ **TROLLEY SHOES**
- ☐ **CHEMICAL CARBON and GRAPHITE ANODES** (Plain or treated)
- ☐ **CARBON RODS FOR SALT BATH RECTIFICATION**
- ☐ **CLUTCH RINGS**
- ☐ **ELECTRIC FURNACE HEATING ELEMENTS**
- ☐ **BRAZING FURNACE BOATS and FIXTURES**
- ☐ **CONTINUOUS CASTING DIES**
- ☐ **PUMP VANES**
- ☐ **PURE CARBON . . . and many other carbon-graphite-metal powder products**



**STACKPOLE CARBON COMPANY, St. Marys, Pa.**

## Magnetic, Contactless Controls

(Continued from page 166)

in the coarse position. The "fine" channel is then opened and the system adjusts to the nearest null of the transducer in the manner described previously.

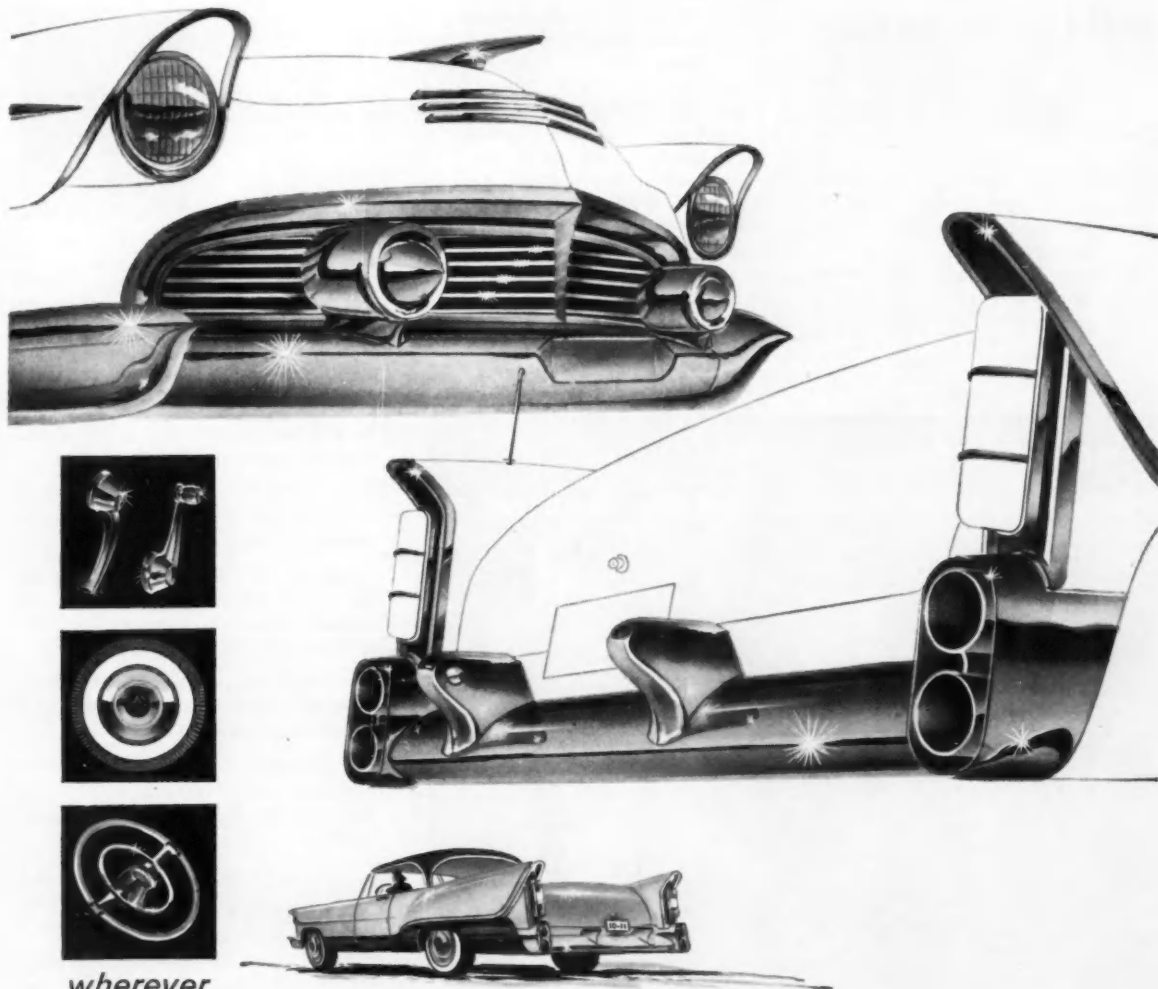
Regarding machine tools to which the new system may be applied, at present most machine tools, even of the highest precision class, have considerable backlash in their drives. As a rule this does not matter so long as the machine operator has learned to make intelligent use of the controls to eliminate errors due to this cause. If a servo with a reversible drive be built to have a precision comparable to backlash in the system then, unless special precautions are taken, the system is likely to be unstable. The precautions may be effective in stabilizing a system with high static accuracy, but experience shows this to be at the expense of dynamic accuracy. The most satisfactory answer seems to be the elimination of backlash.

Lead screws with spring-loaded split nuts represent a solution which is particularly satisfactory when ball screw-nut assemblies are used. The much higher efficiency of the drive allows the use of smaller servo systems that more than compensate for the higher cost of the ball screws. Another solution may be the use of electrohydraulic systems in which backlash is basically different from that in mechanical systems. In large systems with several servo-controlled drives the expense of hydraulic cylinders, servo valves, and pumps may well prove to be lower than those of servo-motors, power amplifiers and backlash-free transmissions.

Finally, it should be remembered that the accuracy of machining does not depend on the measuring system alone, but that final precision is affected by resilience between the point of measurement and tool, by tool wear and by material properties. All these play a part. Very sturdy machine construction and the use of tungsten carbide, ceramic, or diamond tools are desirable to reduce these sources of error.

### AUTOMOTIVE INDUSTRIES . . .

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Automotive and Aviation  
MANUFACTURING*



wherever  
you  
add  
trim...

## THEY'LL PREFER STAINLESS!

*it's a metal they know!*

Sporting goods, jewelry, appliances, fine cutlery — yes, even the car they're trading in — all these things have shown them the strength, beauty, permanence, and remarkable cleanability of stainless steel.

*You'll like stainless, too.* It needs no protective coating. It helps simplify production and increases design flexibility through an unmatched combination of advantages — beauty (complemented by a wide variety of finishes), fabricating ease, remarkable structural strength, and great resistance to all weather conditions.

Let a Crucible engineer show you how stainless steel pays its way. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

# CRUCIBLE

first name in special purpose steels

## Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

## MEN in the NEWS

(Continued from page 41)

National Motor Bearing Co., Inc., Eastern Div.—**Charles Tremiere** has been named replacement sales head.

Lamson Mobilift Corp.—**Ivan E. Howard** has been promoted to general service manager.

Thermoid Co.—**Brayton H. Slade** was elected treasurer.

Ford Motor Co.—**G. E. Johnson** and **N. V. Reichert** have been made industrial relations manager and controller, respectively, for the styling office.

Aro Equipment Corp.—**Wilbur Deutsch** was made sales manager of the Industrial Lubrication Dept.

Lockheed Aircraft Corp., Georgia Div.—**P. H. Bremer** is now chief structural engineer; **J. A. Dilworth**, structural requirements division engineer; and **John Boshar**, Loads and Dynamics Dept. engineer.

Morco, Inc.—**David F. Clark** was made general manager.



Kaiser Aluminum & Chemical Corp.—**Robert G. Beeson** has been chosen railroad development engineer, and **Walter C. Welsh** has been made advertising manager for the Chemical Div.

Hughes Aircraft Co.—**C. E. Blandford** has been named director of advertising and public relations.

Leece-Neville Co.—**Ellis B. Gitchell** has been named maintenance superintendent of all plants.

Square D Co.—**William Younger** was made eastern sales manager, and **William Moriarty** was chosen distributor sales specialist.

Chrysler Corp.—**William P. Stempien** has been promoted to manager of press information.

Westinghouse Electric Corp., Transportation and Generator Div.—**A. C. Meixner** has been named sales manager.

Automatic Transportation Co.—**Edward J. Hansen** was made supervisor of publicity.

New York Air Brake Co., Aurora Pump Div.—**Robert B. Taggart** has been appointed manager of manufacturing.

Minnesota Mining & Mfg. Co., Reinforced Plastics Div.—**Victor H. Colson** has been promoted to manager of technical service.

Chance Vought Aircraft, Inc.—**R. V. Lynch** has been named sales and service manager.

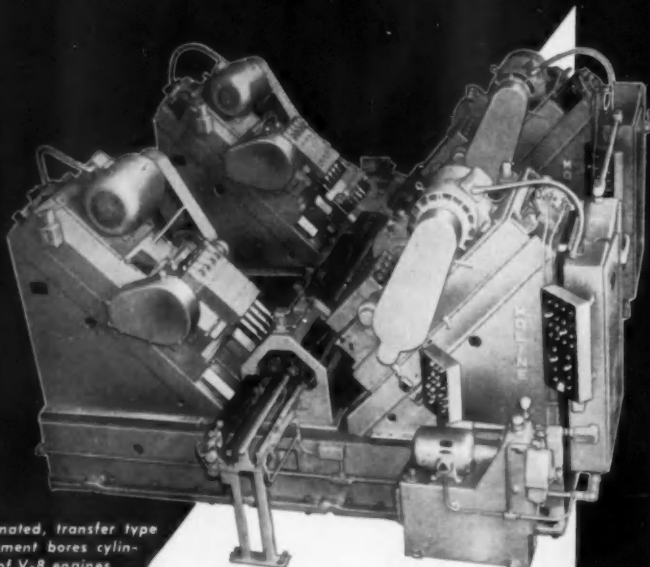
Jack & Heintz, Inc.—**Clarence E. Forbes** has joined the company as manager of technical employment and training.

Caterpillar Tractor Co.—**Robert J. Dawson** has been made manufacturing manager of the new Glasgow, Scotland, plant.

Perfex Corp.—**F. W. Doyle** has been named sales manager of a new division devoted to specialized heat transfer products and other assemblies. **Gene T. Neudeck** assumes his duties as assistant sales manager of the Industrial Radiator Div.

## For Greater...

PRODUCTION • EFFICIENCY • SAVINGS



Automated, transfer type equipment bores cylinders of V-8 engines and chamfers both ends of bores.

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
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Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

Representatives in principal cities.

101



**MOLINE TOOL COMPANY**  
100 20TH STREET MOLINE, ILLINOIS

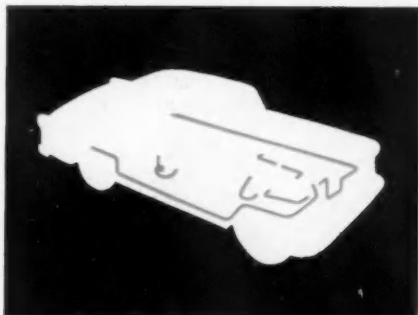


## HUNG UP BY TUBING PROBLEMS?

*Rochester will take you off the hook!*

Rochester engineers and specialists give you a helping hand from planning stage to final product, assuring top quality steel tubing and offering ways to whittle down costs and give profits a boost.

What's more, you can be certain of on-schedule delivery for further cost-cutting efficiency. GM Steel Tubing is rugged, reliable, flexible, versatile—designed to take it and take any shape. It serves as the life-line on more cars, more refrigerators and freezers, more advanced products every day. Contact your Rochester Products Engineer or write us direct for further information.



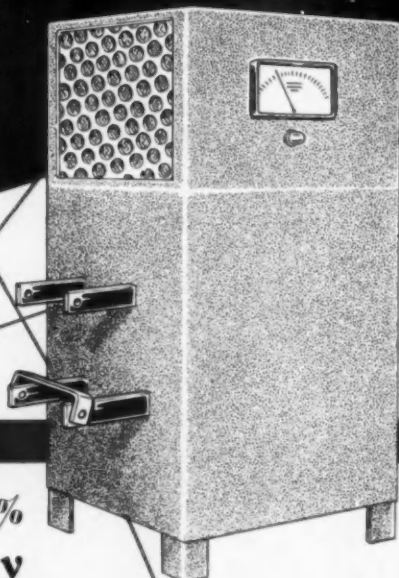
GM STEEL TUBING BY **ROCHESTER**  
**PRODUCTS**

ROCHESTER  
PRODUCTS  
DIVISION OF  
GENERAL MOTORS  
CORPORATION  
ROCHESTER N.Y.

WAGNER BROTHERS

NEW

GERMANIUM  
POWER RECTIFIER



... has 95%  
efficiency  
... with 100% protection!

Germanium has no peer for use as a semiconductor in providing an efficient source of DC current. However, germanium is extremely heat sensitive and must be protected against thermal overload and current faults which, if unchecked, would instantly destroy the germanium junctions.

After two years of research and design in collaboration with the General Electric Company, Wagner Brothers is proud to announce their new, completely protected, highly efficient Germanium Power Rectifier.

General Electric "Safety Cells" are hermetically sealed to shield the germanium element from moisture and any corrosive fumes. Each "Safety Cell" is individually protected from destructive current faults by fast-acting "amp trap" fuses which break the circuit in a fraction of a second, before the germanium junctions can be destroyed.

Further protection from normal overcurrent and under-voltage input is provided by separate breakers on the main contactor and on the blower motor. A pressure switch guards against thermal overloads in case of blower malfunction.

Now you can have the advantages of efficient germanium power rectification—plus, assurance that current faults and overheating will not cause stack burnout, downtime and expensive repairs.

If you need a dependable source of DC current, write for our portfolio of technical information.



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## Improved Piston Pin Quality

(Continued from page 69)

quality control it was now possible for engineering to concentrate its efforts on classifying and segregating entirely by statistical sampling at the end of the lapping line, so that positive segregation of size groups within 0.0001 in. could be accomplished.

The first step in the establishment of statistical sampling was to ascertain the ultimate degree to which the equipment and operators could adhere to blueprint specifications.

This was accomplished by a thorough process capability study based on OD characteristics of consecutively produced pins. The study covered all popular piston pin sizes over a period of several working days.

The data were recorded on regular x and R charts, using a sub-group number of (5) which facilitated rapid computation. Under normal high production operating conditions the process capability was established. It was found that the process could hold tolerances well within our requirements.

Although we made a frequency distribution of the study for graphic portrayal, the standard deviation was calculated from R using the  $d_2$  factor of 2.326 in. for estimating sigma. The results were not surprising in view of the high precision capacity of the equipment. Next, it was necessary to decide in which direction to travel to obtain the maximum benefits. The decision was to use continuous sampling inspection for control of size within specified classes of 0.0001 in.

From previous experience and from the process capability study, we were aware of certain assignable causes for deviation in OD size from one class to another. Although everyone continued to strive for reasonable perfection, these conditions were accepted without too much difficulty, particularly when it was calculated that maximum amount of deviations would be less than 1 per cent. By judicious application of sorting methods by the operator, even this small percentage could be salvaged and classified.

By assignable causes is meant such conditions as temporary variations in temperature control, wheel wear, machine adjustments or wheel dressing. The high productivity rate eliminates the possibility of perfect interception of all pins in process during one of the above process

# Design "Low Cost" Into YOUR Equipment

# GITS

*World's Largest Selection of  
Low-Cost Lubricating Devices*

## CLIPS FOR ATTACHING TUBING

When ordering,  
specify  $\frac{1}{4}$ ",  $\frac{3}{8}$ "  
or  $\frac{1}{2}$ " tubes.  
Style TF.



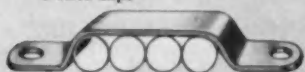
Single Clips



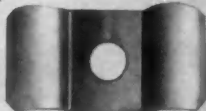
Double Clips



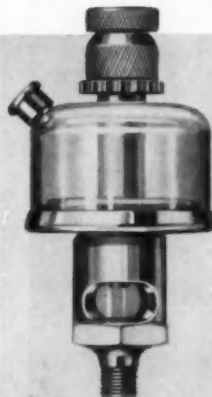
3-Tube Clips



4-Tube Clips



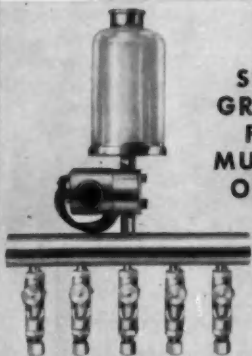
Double Clips — Wing Type



## SIGHT GRAVITY FEED OILERS

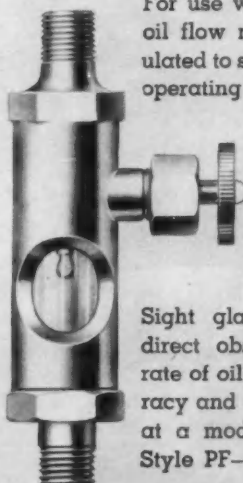
Rate of oil  
flow regulat-  
ed by needle  
valve, direct-  
ly observed  
through sight  
glass in stem.

Shut-off knob does not affect  
needle valve adjustment. Visi-  
ble oil supply. Non-breakable.  
Tops in convenience and de-  
pendability, at low cost. Style  
NFU—No. 3602-A.



## SIGHT GRAVITY FEED MULTIPLE OILERS

This one unit replaces 3 to 8  
individual oilers. Maximum  
practicality in a small central  
lubrication system. Positive cut-  
off during idle periods. Individ-  
ual vibration-proof needle valve  
adjustments. With solenoid con-  
trol (illustrated): Style MDS—  
No. 4685-A. Without solenoid:  
Style MD.



## SIGHT GAUGES

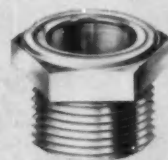
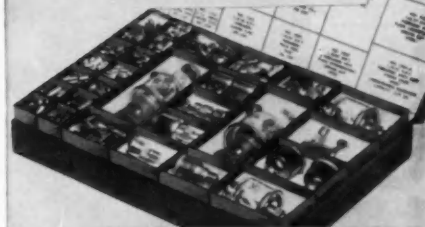
For use where rate of  
oil flow must be re-  
gulated to suit changing  
operating conditions.

Needle  
valve  
permits  
extremely  
accurate  
adjustment  
of oil feed.

Sight glass provides  
direct observation of  
rate of oil flow. Accu-  
racy and convenience  
at a moderate price.  
Style PF—No. 4290.

**LUBRIKIT . . .** An assort-  
ment of 95 oil cups of 29  
different types. Gits sales  
records show these oilers  
are most used for replace-  
ment and maintenance.  
Contents of each separate  
bin are clearly described  
on Inside Cover.

Special Introductory Price  
Just **\$14.95** F.O.B. Factory  
Satisfaction or your money back



## GEAR CASE GAUGES

This oil gauge plug permits in-  
stant checking of oil level within  
a transmission or gear case. For  
use where construction permits  
insertion in tapped hole. A val-  
uable addition to any such  
equipment—at very low cost.  
Style BW—No. 4042.

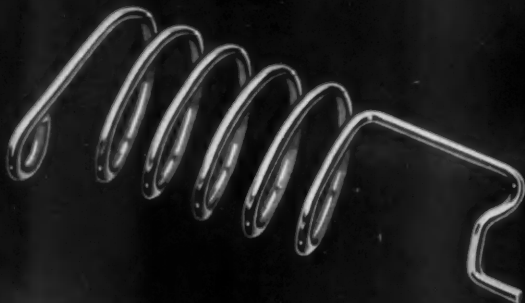
Don't price yourself out of the mar-  
ket. When you design proper lubri-  
cation into your equipment, specify  
GITS Lubricating Devices—the wid-  
est selection available anywhere.  
The items pictured above are only a  
few of our many thousands of lubri-  
cating devices. At the design stage,  
get the GITS story. Free Engineering  
Service. Send NOW for your free  
Catalog.

## GITS BROS. MFG. CO.

The Standard For Industry For Almost Half A Century

1870 South Kilbourn Avenue  
Chicago 23, Illinois

Clip this page for handy "rough reference"



# Accurate

## CREATES a Spring . . .

This is an Accurate Spring! It's different than the rest, because it's *designed* and *engineered* for its job. It has been *created* by Accurate's skilled craftsmen who approach all spring problems with experience . . . and imagination.

When YOU need the best of springs, held to the closest tolerances and manufactured at the lowest cost — YOU need Accurate!

*Accurate  
Springs*

ACCURATE SPRING MANUFACTURING COMPANY  
3810 West Lake Street • Chicago 24, Illinois

SPRINGS  
WIRE FORMS  
STAMPINGS

level changes. These conditions do not affect the basic machine capability, but they do tend to influence the level of operation temporarily.

Figure 2 shows the striking results of statistical quality control.

Over 85 per cent of total production is now being maintained within a single class, a negligible amount falling within classes A and E. This is an indication that the operators are now using their precision machines to much better advantage. With the spread of production narrowed, it now becomes a relatively simple task for the continuous sampling inspector to regulate the flow of pins into classifications of 0.0001 in.

The use of in-process statistical sampling has accomplished more than size control; it has also improved the overall quality characteristics of the piston pins. The reasons for this overall improvement are:

- (a) Mechanical or automatic gaging devices are eliminated. These devices may scratch and nick the piston pin surface which is finished to specifications of four microinches.
- (b) Two handling operations have been eliminated, thus further reducing possibility of marring the surface finish.
- (c) Inspection hours have been reduced 25 per cent.
- (d) Inventory problems for pin fitting are eased because of reduction of inventory for the less popular outside diameter classes.

The before and after production curves shown in Fig. 3 tell better than any words what can be achieved with statistical quality control. It is the belief of the writers that this type of control is feasible for almost every industrial application. It is not always necessary to apply complicated statistical methods to achieve maximum control of quality. But this method does require complete co-operation throughout the plant, and this can be obtained only if the aims of quality control are understood by everyone from top management down to the production line worker.

### AUTOMOTIVE INDUSTRIES . . .

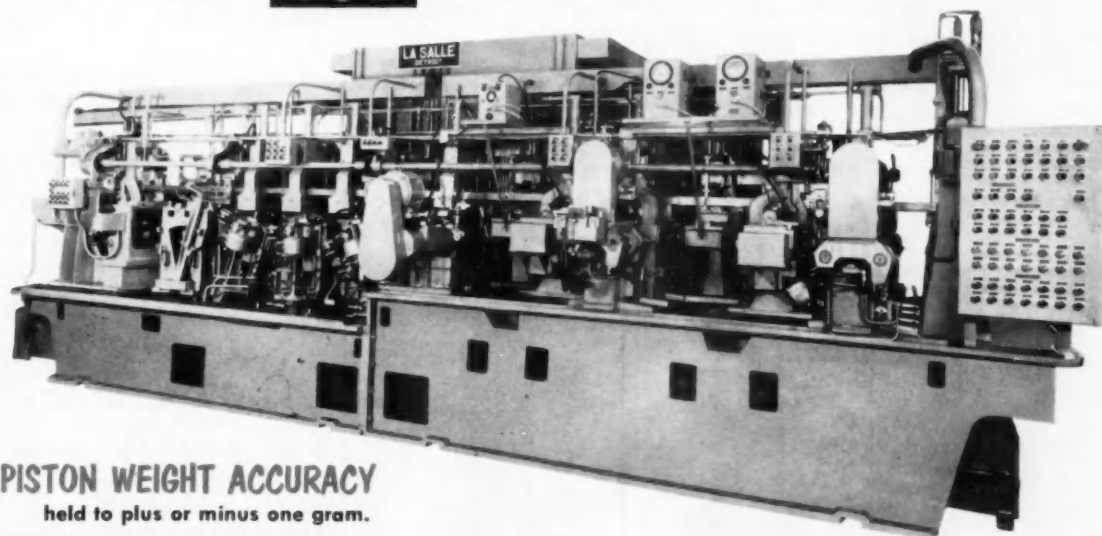
is your News Magazine of  
Automotive and Aviation

**MANUFACTURING**



# La Salle **AUTOMATED PISTON LINE**

PRODUCES **400** PISTONS PER HOUR



## PISTON WEIGHT ACCURACY

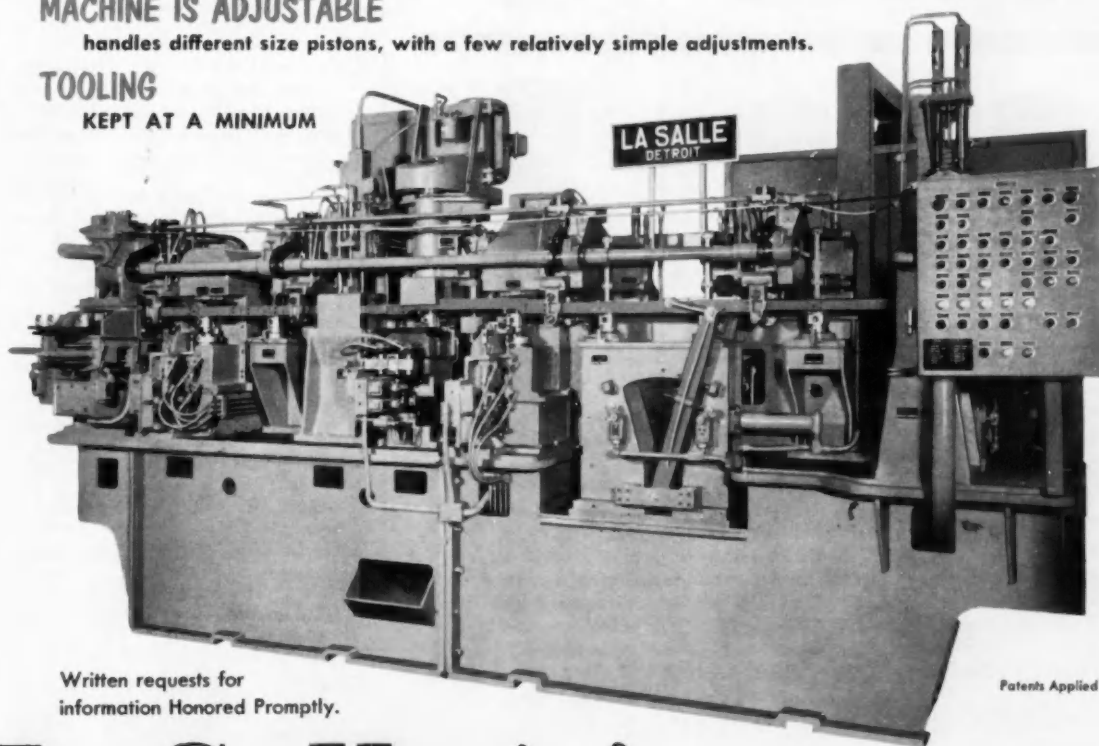
held to plus or minus one gram.

## MACHINE IS ADJUSTABLE

handles different size pistons, with a few relatively simple adjustments.

## TOOLING

KEPT AT A MINIMUM



Written requests for  
information Honored Promptly.

Patents Applied for.

**La Salle** *tool, inc.* **ENGINEERING & BUILDING  
SPECIAL MACHINERY**  
3840 EAST OUTER DRIVE • DETROIT 34, MICHIGAN

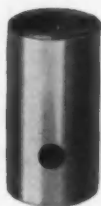
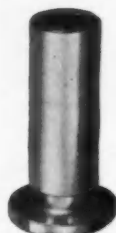
AUTOMOTIVE INDUSTRIES, May 15, 1956

## More Government Contract Awards

**T**HIS latest list of Government prime contracts that have been awarded covers the period from Mar. 27 to Apr. 25, 1956. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

ACF INDUSTRIES, INC., Hyattsville, Maryland  
Modification of flight simulator—\$3,344,885  
ADEL PRECISION PRODUCTS, Div of General Metals Corp., Burbank, Calif.  
Pump assy.—\$38,148  
AEROQUIP CORP., Jackson, Michigan  
Hose assemblies—14,638 ea.—\$119,818  
AIRESEARCH MANUFACTURING CO., Los Angeles, Calif.  
Hydraulic pump—30 ea.—\$234,513  
Air on-off valves—\$102,511

## JOHNSON *tappets*



*keep pace with today's engines*

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

*"tappets are our business"*

**JOHNSON  PRODUCTS**  
MUSKEGON, inc. MICHIGAN

AVCO MANUFACTURING CORP., Lycoming Div., Stratford, Conn.  
Crankshaft machining and balancing assy.—1500 ea.—\$2,535,000  
H. N. BAILEY AND ASSOCIATES, Los Angeles, Calif.  
Pump assy.—2—\$75,000  
THE BAKER-RAULANG CO., Cleveland, Ohio  
Trucks, crane and fork lift, electric—8 ea.—\$50,081  
BEECH AIRCRAFT CORP., Wichita, Kansas  
Airplanes—\$700,000  
Jettisonable fuel tanks—\$6,808,026  
BELL AIRCRAFT CORP., Helicopter Div., Fort Worth, Texas  
Helicopters—24—\$4,105,014  
Maintenance H-13 type aircraft—91 ea.—\$177,552  
BEMISS EQUIPMENT CORP., Richmond, Virginia  
Diesel electric generator sets—\$26,618  
BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.  
Degasser—3144—\$39,992  
Fuel control parts—\$65,899  
Parts for control assy.—\$103,409  
Maintenance parts—various—\$273,795  
BENDIX AVIATION CORP., Eclipse-Pioneer Div., Teterboro, New Jersey  
Indicator, gyro horizon—1636—\$847,448  
BENDIX AVIATION CORP., Hamilton Div., Hamilton, Ohio  
Overhaul and modification of fuel controls—250 ea. \$132,500  
BENDIX AVIATION CORP., Red Bank Div., Eatontown, New Jersey  
Generators—26 ea.—\$92,524  
Generators, aircraft—\$200,417  
BENDIX AVIATION CORP., Scintilla Div., Sidney, New York  
Maintenance parts—various—\$85,406  
BENDIX AVIATION CORP., Utica Div., Utica, New York  
Starters—174 ea.—\$524,790  
Modification of starters—740—\$388,221  
BOEING AIRPLANE CO., Wichita, Kansas  
Trainers—5—\$99,331  
Maintenance of aircraft—\$711,207  
BOEING AIRPLANE CO., Seattle, Washington  
Implementation of aircraft program—\$1,500,000  
BORG-WARNER CORP., Pesco Products Div., Bedford, Ohio  
Maintenance parts—\$30,880  
Spring fuel pump valve control—117 items \$167,287  
Spring-hydraulic pump—206 items—\$138,995  
CATERPILLAR TRACTOR CO., Peoria, Ill.  
Power plant Diesel generator—\$103,297  
CESSNA AIRCRAFT CO., Wichita, Kansas  
Airplanes—\$5,034,280  
Flight test program—\$2,555,575  
CHAMPION SPARK PLUG CO., Toledo, Ohio  
Spark plugs—various—\$271,000  
CALIFORNIA RESEARCH CORP., San Francisco, Calif.  
Studies and tests on Diesel engine—\$37,000  
CHRYSLER CORP., Engineering Div., Detroit, Mich.  
Engineering design on fire control and sighting equipment for tank series—\$597,204

(Turn to page 184, please)

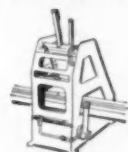
YOU GET A

# Two-Fold

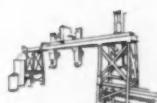
## CREATIVE AUTOMATION SERVICE

AT

W. F. & JOHN BARNES



Probe-Type  
Inspection Machine



Transverse-Type  
Loader



Metal Fastener  
Assembly Equipment

Now to better serve your needs and help you solve automation problems quickly, Barnes offers a two-fold coordinated service.

### COMPLETE PRODUCTION-LINE ENGINEERING

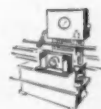
1 For new production line methods calling for either automatic or semi-automatic operations, you'll find at Barnes an experienced engineering staff to work with you. Detailed plans and proposals will be submitted for your consideration and can be depended upon to give you the latest in automation ideas and the very best of proven mechanical, hydraulic, and electrical actuation methods. Ask for a free survey early in your planning program.

### DESIGNING & BUILDING SPECIALIZED UNITS

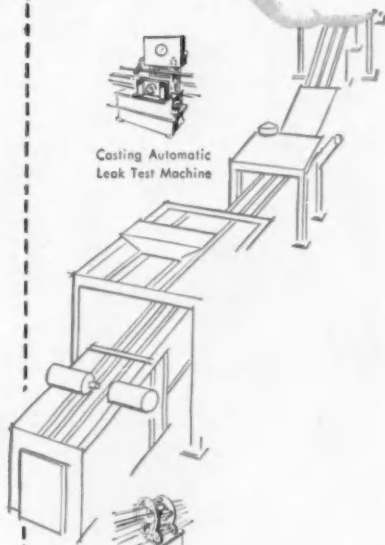
2 The second and equally important part of Barnes two-fold service is the designing and building of specialized individual units to suit your specific needs. At Barnes you'll find a coordinated service where electrical, mechanical, hydraulic, fixture and tool engineers work together as a team. The combined efforts of a highly skilled and experienced engineering staff, coordinated with complete manufacturing facilities, help you save time by eliminating divided responsibility.

### ASK FOR A METHODS ANALYSIS

Find out today why more and more Production Executives are turning to Barnes for a practical solution to their automation problems. We will be pleased to analyze your requirements, offer recommendations, and submit a cost estimate in a formal proposal if you so desire.



Casting Automatic  
Leak Test Machine



Automatic  
Roll-Over Unit

Builders of Better  
Machines and  
Equipment since  
1872



### AUTOMATION SECTION

425 S. WATER ST.

• ROCKFORD, ILLINOIS

SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL  
PROCESS EQUIPMENT • SPECIAL ELECTRICAL CONTROLS

# FOR DEPENDABILITY AND ECONOMY, SHERMAN



IN ACTION, two stabilizer cylinders brace the Sherman Digger. All power is applied to the boom, dipper stick and shovel by the hydraulic lift, crowd, actuating and swing cylinders. As a result, cylinder pivot ends and hinge pins are in constant motion under heavy loads. Excellent physical properties of Republic C-1018 Cold Drawn Steel have proved more than equal to the task.

# REPUBLIC



*World's Widest Range of Standard Steels*



# SPECIFIES REPUBLIC COLD DRAWN STEEL

Sherman Products, Inc., of Royal Oak, Michigan, insists on reliability and economy in every part of the popular Sherman Power Digger. That's why Republic Union Cold Drawn Steel is specified for hinge pins and pivot ends of all hydraulic operating cylinders.

Whenever the digger is working, these parts are subjected to severe cyclic loading, transmitting all forces to the frame of the unit. Republic Cold Drawn Steel is ideally suited to this application since the cold finishing process materially improves the ultimate strength, yield point and hardness provided by the same analysis of hot rolled steel.

In addition to quality of product, Sherman gains three major production advantages. First, C-1018 has a high degree of machinability permitting rapid cut off, drilling for the pivot pin and facing to assure an accurate fit when the end is welded to the cylinder tube. Second, the inherently good cold drawn surface requires no machining to improve surface prior to painting. Third, C-1018 permits carburizing so that hinge pins can be given a very hard wearing surface without disturbing the tough shock-resisting interior.

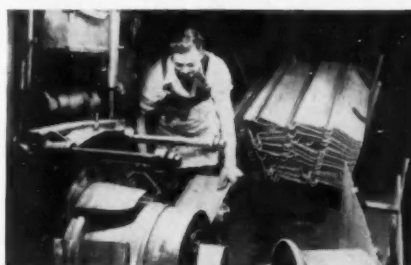
Whatever your product or production problem—machinability, surface finish, accuracy of size and cross section or improved physical properties—it will pay you to investigate Republic Cold Drawn Steel. Get the facts from your local Republic Office or mail the coupon, today.

# STEEL

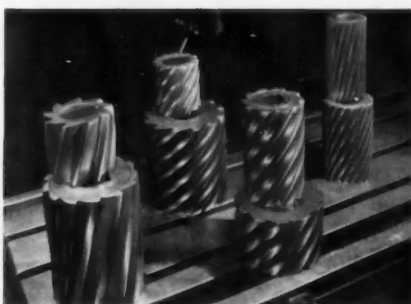
*and Steel Products*



**QUALITY FASTENER PRODUCTS** like the hex head cap screws shown here are a century-old tradition at Republic's Bolt and Chain Division. You can choose from over 20,000 standard and 8,000 special types and sizes—all produced with precise quality control from raw ore to finished product to assure maximum dependability.



**ECONOMICAL TRUCK TIRE RIMS** are formed on special mandrels by the Cleveland Welding Division of American Machine & Foundry Company, in Cleveland, Ohio. Use of Republic Hot Rolled Carbon Special Sections assures strong, lightweight consistent-quality rims. Production time and money are saved by not buying excess metal and machining it away.



**DEPENDABLE MACHINING OPERATIONS** start with uniform quality tool steels. As a leading producer of tool steels, Republic maintains complete stocks including automotive die steels, precision ground flat stock and cold drawn shank steel. For one piece or a truckload delivered where you want it, on time—call Republic, or mail coupon for further information.

## REPUBLIC STEEL CORPORATION

Dept. C-1672

3106 East 45th Street, Cleveland 27, Ohio

Please send me full information on:

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|--|--|
| <input type="checkbox"/> Cold Finished Steels        | <input type="checkbox"/> Tool Steels         |
| <input type="checkbox"/> Hot Rolled Special Sections | <input type="checkbox"/> Hex Head Cap Screws |

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

(Continued from page 180)

**CLARK EQUIPMENT CO.,** Battle Creek, Mich.

Truck, fork lift, gasoline—30 ea.—\$133,640

**CLARK EQUIPMENT CO.,** Buchanan, Michigan

Truck, fork lift, gasoline—26 ea.—\$192,554

**CONTINENTAL AVIATION AND ENGINEERING CORP.,** Detroit, Mich.

Product improvement—\$3,599,559

**CONTINENTAL MOTORS CORP.,** Muskegon, Mich.

Engines—\$255,963

Design and fabrication of tooling—

job—\$221,248

Engine spare parts—1392 ea.—\$32,670

**DANA CORP.,** Toledo, Ohio

Shaft, propeller, assy.—\$32,519

Shaft, propeller—\$60,811

**DONALDSON COMPANY, INC.,** St. Paul, Minn.

Muffler assy.—6435—\$84,907

**DOUGLAS AIRCRAFT CO., INC.,** Long Beach, Calif.

Conversion of aircraft—\$22,685,705

**DOUGLAS AIRCRAFT CO., INC.,** Tulsa Div., Tulsa, Oklahoma

Modification of aircraft—\$1,500,000

**THE ELECTRIC AUTO-LITE CO.,** Toledo, Ohio

Spark plug, shielded—\$76,140

Kit, repair, generator—\$76,763

**FAIRBANKS, MORSE & CO.,** Fair Lawn, New Jersey

Generators, Diesel engine driven—\$25,632

**FAIRCHILD ENGINE & AIRPLANE CORP.,** Stratos Div., Bay Shore, L. I., New York

Overhaul of turbine assembly—job—\$88,470

Services—various—\$172,949

**FAIRCHILD ENGINE AND AIRPLANE CORP.,** Fairchild Aircraft Div., Hagerstown, Maryland

Testing of power plant installation—

\$65,002

**FARGO MOTOR CORP.,** Highland Park, Mich.

10 trucks—\$27,242

**THE FIRESTONE TIRE & RUBBER CO.,** Akron, Ohio

Shell—320,000 ea.—\$5,401,600

Shroud, track—923 ea.—\$40,971

Tire, 7.50 x 20—\$207,853

**FORD MOTOR CO.,** Washington, D. C.

33 trucks—\$49,756

Trucks—57—\$93,262

Automobiles—109 ea.—\$138,421

Buses—7 ea.—\$21,680

**FORD MOTOR CO.,** Dearborn, Mich.

20 MM automatic gun—\$65,310

Turbo jet engines—\$70,483,279

**FORD MOTOR CO.,** Ford International, New York, N. Y.

Automobiles—11 ea.—\$14,844

**THE FOUR WHEEL DRIVE AUTO CO.,** Clintonville, Wis.

Truck equipped with snow-plow—1 ea.—

\$20,506

**GARWOOD INDUSTRIES, INC.,** Wayne, Mich.

Spare parts—60 ea.—\$66,407

**GENERAL DYNAMICS CORP.,** Convair Div., San Diego, Calif.

Training unit—\$100,310

Facilities—\$3,300,000

Facilities in support of production—

\$5,923,582

**GENERAL ELECTRIC COMPANY,** West Lynn, Mass.

Turbosuperchargers—\$1,817,592

**GENERAL MOTORS CORP.,** AC Spark Plug Div., Flint, Mich.

Spare parts of fire control system—88

ea.—\$74,395

Spare parts—6536 ea.—\$48,995

Gun-bomb-rocket sight—\$2,834,869

**GENERAL MOTORS CORP.,** Buick Motor Div., Flint, Mich.

Maintenance and spare parts—various—

\$64,199

**GENERAL MOTORS CORP.,** Chevrolet Motor Div., Detroit, Mich.

Trucks—152—\$242,350

Automobiles—171—\$212,490

**GENERAL MOTORS CORP.,** Cleveland Diesel Engine Div., Cleveland, Ohio

Parts for Diesel engines—10,687—

\$448,680

Overhaul and modify Diesel engine—

2 ea.—\$79,590

**GENERAL MOTORS CORP.,** Foreign Dist. Div., New York, N. Y.

Automobiles—13—\$27,455

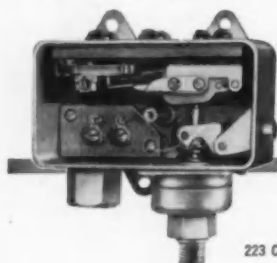
**GENERAL MOTORS CORP.,** GMC Truck and Coach Div., E. Pontiac, Mich.

Spare parts—8168 ea.—\$101,447

Buses—2 ea.—\$21,326

(Turn to page 186, please)

## COMPACT DETROIT CONTROL PROTECTS YOUR DIESEL



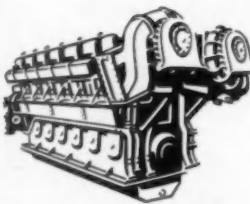
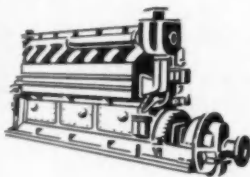
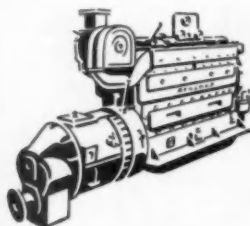
223 Control, cover removed

Detroit 223 Control has wide application in lube oil pressure and temperature alarm systems. It is also used as an automatic engine control switch for emergency shut-down and in other critical functions. This rugged control is only 4 $\frac{1}{2}$ " x 4 $\frac{3}{8}$ " x 2 $\frac{3}{4}$ " and weighs 2 $\frac{1}{2}$  pounds. The 223 Control is water tight and not affected by conditions of high temperature and high humidity.

This automatic switch is actuated by either pressure or temperature. It can control several circuits, it can actuate a program of safety circuits or it can govern one circuit alone.

Marine, locomotive and stationary diesel engines, pumps, oil drilling engines, mobile compressors and dynamos are only a few applications where Detroit 223 Control safeguards valuable engines and machinery.

Bulletin 257 will be forwarded at your request.



Detroit Controls supplies a wide variety of dependable automatic controls for industry.

# DETROIT CONTROLS

CORPORATION

5900 TRUMBULL AVE. • DETROIT 8, MICHIGAN

Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

AUTOMATIC CONTROLS for INDUSTRIAL USES

TRANSPORTATION • AVIATION • AIR CONDITIONING  
REFRIGERATION • DOMESTIC HEATING • HOME APPLIANCES

Representatives in Principal Cities

Canadian Representatives:

RAILWAY AND ENGINEERING SPECIALTIES, LTD.

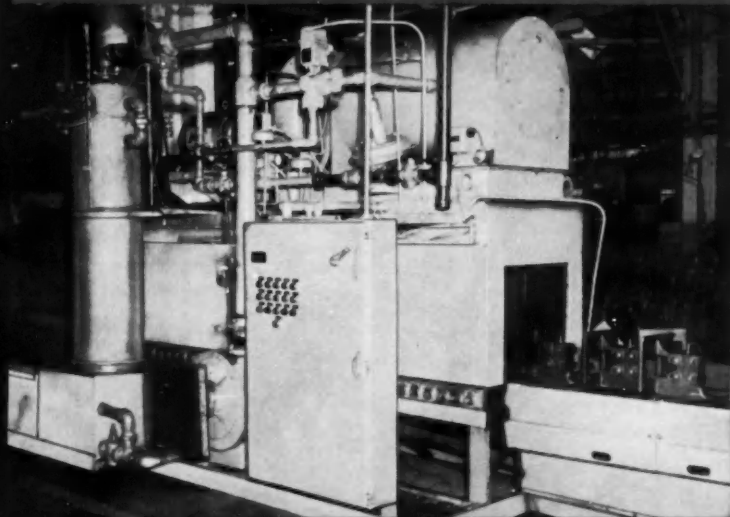
Montreal, Toronto, Winnipeg



# LOW INITIAL COST

# Parts & Surfaces Washed WITH PETERS-DALTON POWER SPRAY WASHERS

## HIGHEST EFFICIENCY

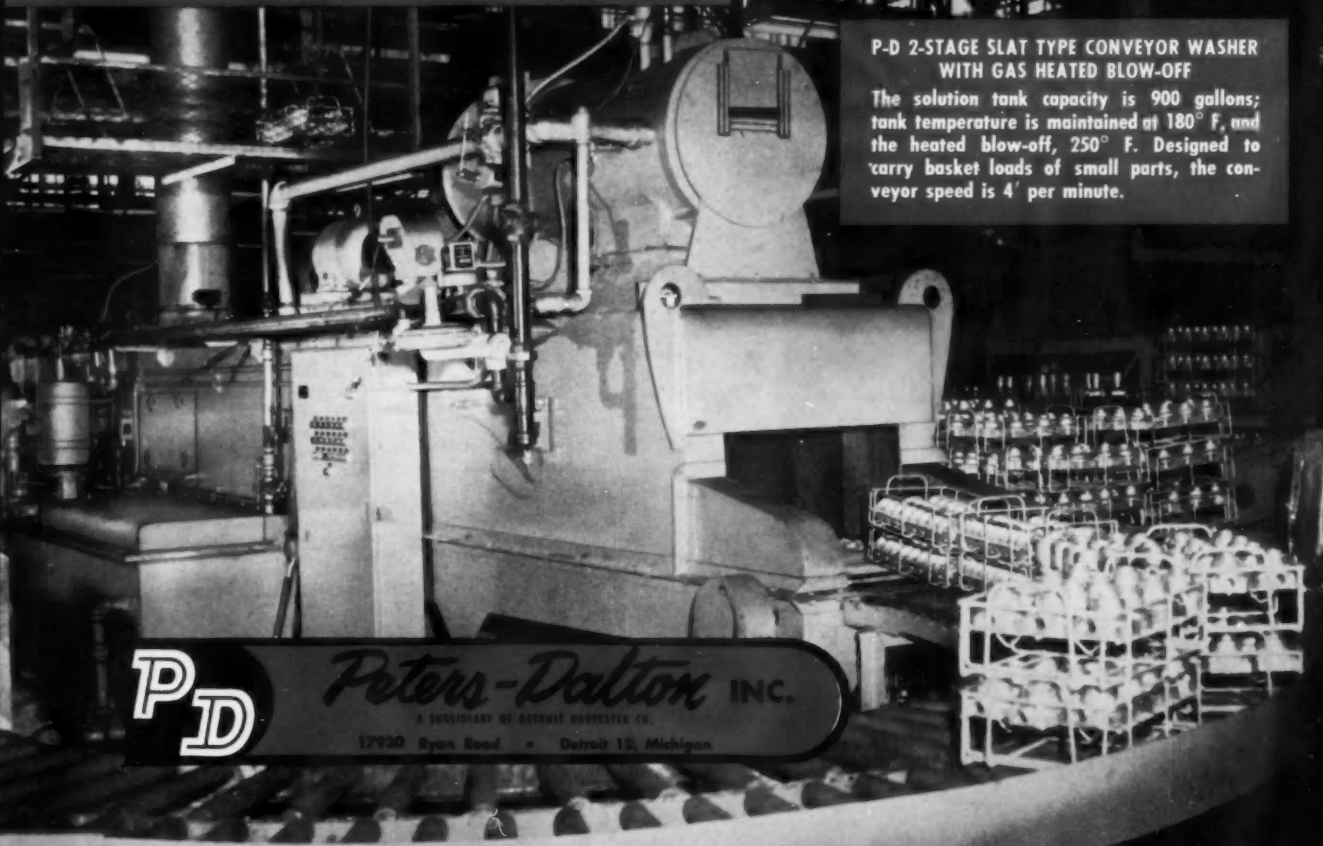


### P-D SINGLE STAGE POWER ROLL WASHER FOR CLEANING FIXTURES

Featuring the newly developed P-D Hydrone Heater, it is completely gas heated with heated blow-off. The solution tank capacity is 450 gallons; tank temperature is maintained at 180° F, and the heated blow-off, 180° F. The conveyor operates at variable speeds of 5' to 15' per minute to handle up to 400 75 lb. fixtures per hour.

The function of a Power Spray Washer is, of course, to clean metal parts. However, varying requirements call for different type washing and cleaning applications. Shown here are two Peters-Dalton Power Spray Washers, designed and built to do specific jobs—jobs that call for differing washing stages, conveyor speeds, weight capacities and product sizes. In both cases, they efficiently perform their task of removing cleaning and cutting oils and metal dust and chips in the plant of a major parts manufacturer.

Whatever your needs, Peters-Dalton Engineers can design, develop and fabricate for you (and at lowest cost) the correct type of washer to perform the proper cleaning and surface treatment you should have for your products. Give us your requirements, regardless of size. Just write, wire or phone . . . we'll be glad to tell you more.



### P-D 2-STAGE SLAT TYPE CONVEYOR WASHER WITH GAS HEATED BLOW-OFF

The solution tank capacity is 900 gallons; tank temperature is maintained at 180° F, and the heated blow-off, 250° F. Designed to carry basket loads of small parts, the conveyor speed is 4' per minute.



*Peters-Dalton* INC.

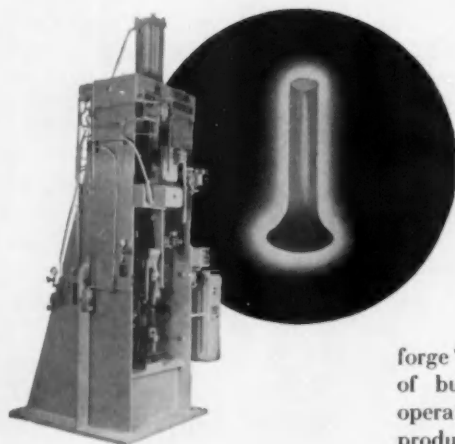
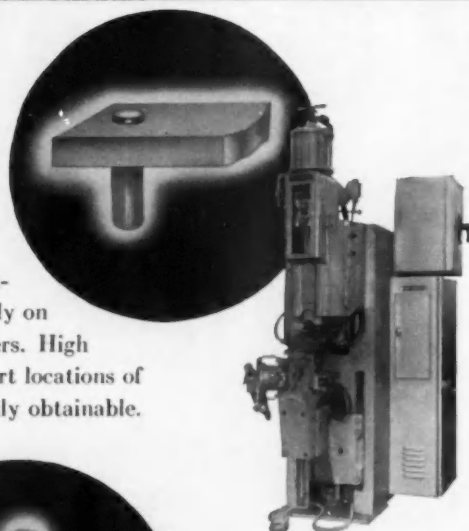
A SUBSIDIARY OF DETROIT HEDGECOCK CO.

17930 Ryan Road • Detroit 15, Michigan

# CONSIDER ELECTRO-FORGING

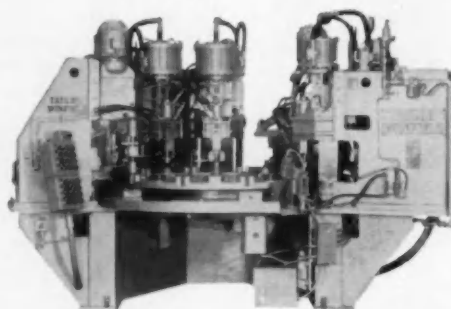
## Resistance Hot Upsetting

Upsetting or riveting operations are performed quickly on standard resistance welders. High production and precise part locations of dissimilar metals are readily obtainable.



## Metal Gathering

Operations on ends of rods, also by resistance heating, are done in machines with forge "flow control." Shape and size of bulb ends permit machining operations on bulb for most efficient product manufacture.



## High Production

Special machines can mechanize loading, unloading and perform machining operations in addition to electro-forging at minimum labor cost.

Ask a T-W man about Electro-Forging.



**TAYLOR-WINFIELD Corporation**  
WARREN, OHIO

**ELECTRIC RESISTANCE AND ARC WELDING MACHINES**

*Sales and Service*

CHARLOTTE • CHATTANOOGA • CHICAGO • CLEVELAND • DALLAS  
DAYTON • DENVER • DETROIT • LOS ANGELES • PHILADELPHIA  
PORTLAND, OREGON • SEATTLE • ST. LOUIS • STAMFORD  
OAKVILLE AND WINDSOR, ONTARIO

(Continued from page 184)

- GENERAL MOTORS CORP.**, New Departure Div., Bristol Conn.  
Bearings—20,000 ea.—\$78,800
- THE GENERAL TIRE AND RUBBER CO.**, Akron, Ohio  
Nose wheel assemblies—488 ea.—\$53,997
- B. F. GOODRICH CO.**, Akron, Ohio  
Tire, 7.50 x 20—\$233,031
- THE GOODYEAR TIRE & RUBBER CO.**, INC., Akron, Ohio  
Brake assys.—3622—\$734,432  
Wheel brake and cylinder assys.—\$963,934  
Tire, 11.00 x 18—1227 ea.—\$87,227
- THE HEIL CO.**, Milwaukee, Wis.  
Refueler, aircraft—36 ea.—\$292,830
- HERCULES MOTORS CORP.**, Canton, Ohio  
Crankshaft, engine assembly for truck, trailer—\$76,598
- THE FRANK G. HOUGH CO.**, Libertyville, Ill.  
Tractor, aircraft—1 ea.—\$227,925
- INTERNATIONAL HARVESTER CO.**, Washington, D. C.  
Trucks—13—\$36,844
- INTERNATIONAL HARVESTER EXPORT CO.**, Chicago, Ill.  
Diesel crawlers tractors—3 ea.—\$58,671
- LEAR, INC.**, Lear-Romec Div., Elyria, Ohio  
Pump, pressure, oil free, dehydrator, controls, pressurizing—422—\$86,490
- LINK AVIATION, INC.**, Binghamton, New York  
Trainers—\$3,000,000
- LOCKHEED AIRCRAFT CORP.**, Burbank, Calif.  
Aircraft—\$11,752,852  
Flight testing turbo-prop engine—\$62,463
- LOCKHEED AIRCRAFT SERVICE INC.**, Burbank, Calif.  
Restoration of ten aircraft—\$98,314
- LORD MANUFACTURING CO.**, Erie, Pa.  
Mounts—69,980 ea.—\$40,539
- MCDONNELL AIRCRAFT CORP.**, St. Louis, Missouri  
Spare parts—various—\$192,789
- MACK MANUFACTURING CO.**, Washington, D. C.  
Truck, fire fighting—27 ea.—\$282,693
- THE GLENN L. MARTIN CO.**, Baltimore, Maryland  
Furnish components for fuel system installation—\$320,000
- MOHAWK RUBBER COMPANY**, Akron, Ohio  
Tire, 7.50 x 20—\$553,600
- MONROE AUTO EQUIPMENT CO.**, Monroe, Michigan  
Tank spare parts—2241 ea.—\$365,142
- THE NEW YORK AIR BRAKE CO.**, Watertown, New York  
Hydraulic pump assys.—various—\$157,295
- NORDBERG MANUFACTURING CO.**, Milwaukee, Wisconsin  
Generators, Diesel engine driven—\$48,798
- NORTH AMERICAN AVIATION, INC.**, Fresno, Calif.  
Prototype installation of electronic equipment—9 ea.—\$170,000  
Modification of aircraft—54 ea.—\$345,000

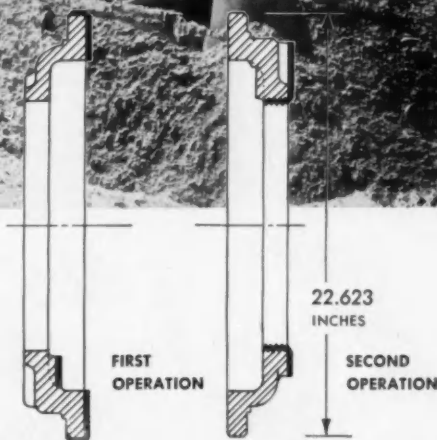
(Turn to page 188, please)



HELPING THE GIANT

**CAT** \*

CHANGE THE FACE OF THE EARTH



HEAVY LINES INDICATE MACHINED SURFACES

## The POTTER & JOHNSTON 6-DRE-40 Automatic

**Chuckling Turret Lathe Produces BIG parts like this  
QUICKLY, ACCURATELY and ECONOMICALLY**

Virtually "changing the face of the earth" is a rough, tough job that takes rugged, built-for-the-purpose equipment like the famous CATERPILLAR Tractors. And turning out component parts for these mighty marvels is a tough job too . . . one that calls for the rugged power, extra rigidity and all-round versatility of a machine like the POTTER & JOHNSTON 6-DRE-40 Automatic Chuckling Turret Lathe.

\*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**NAME:** Bracket Flywheel

**MATERIAL:** Steel Casting

**REQUIRED:** 2 Automatic Cycles involving several precision cuts AND A 15 $\frac{1}{2}$ " - 12 N F THREAD!

If you have difficult machining jobs - and who hasn't in these days when complex parts must be produced fast - why not borrow a page from the CATERPILLAR success story. Depend on a POTTER & JOHNSTON AUTOMATIC. Get started today . . . write for full information on the P&J 6-DRE-40 and on the other Automatic Chuckling Turret Lathes in the complete P&J line.



Bulletin No. 159

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**MODERNIZE WITH POTTER & JOHNSTON . . . REPLACE FOR PROFIT**

AUTOMOTIVE INDUSTRIES, May 15, 1956

187

(Continued from page 186)

**NORTH AMERICAN AVIATION, INC.,**  
Los Angeles, Calif.  
Modification of aircraft—\$3,621,990  
Flight test program—\$163,969  
Airplanes, spare parts—\$40,000,000  
Facilities for production and testing—  
\$6,463,000

**PACIFIC CAR AND FOUNDRY CO.,**  
Renton, Washington  
Modification and processing of T97 and  
T108 vehicles—various—\$1,621,200

**PRICE BATTERY CORP.,** Hamburg, Pa.  
Battery—2338 ea.—\$92,087

**READING BATTERIES, INC.,** Reading, Pa.  
Battery—49,479 ea.—\$592,263

**THE ROVER CO., LTD.,** London, England  
Pickup truck—10 ea.—\$17,005

**RYAN AERONAUTICAL CO.,** San Diego,  
Calif.  
Drones and spare parts—59 ea.—  
\$300,000  
Target drones—80—\$2,115,043

**SEIBERLING RUBBER CO.,** Akron, Ohio  
Tire 7.50 x 20—\$138,950

**SOLAR AIRCRAFT COMPANY,** San Diego,  
Calif.  
Tailpipe assys.—486 ea.—\$143,341

**SPERRY RAND CORP.,** St. Paul, Minn.  
Facilities—\$155,400

**STEWART-WARNER CORP.,** South Wind  
Div., Indianapolis, Ind.  
Heater assy., aircraft—2 items—\$39,778

**STUDEBAKER-PACKARD CORP.,** Detroit,  
Mich.  
Design and develop engine—\$150,000

**SUNDSTRAND MACHINE TOOL CO.,**  
Rockford, Ill.  
Transmission and governor assemblies—  
\$4,675,545  
Transmission and governor and drive  
assembly, frequency and load control-  
ler, automatic paralleling control—  
4583—\$8,537,675

**SURFACE COMBUSTION CORP.,** Jan-  
itral Aircraft-Automotive Div., Colum-  
bus, Ohio  
Heater assy.—7 items—\$245,612

**O. E. SZEKELY AND ASSOCIATES, INC.,**  
Commerce, Georgia  
Trailer, lift bomb—261 ea.—\$344,686  
Rack assemblies—\$352,589

**THOMPSON PRODUCTS, INC.,** Detroit,  
Mich.  
Tie rods—\$80,888

**UNITED AIRCRAFT CORP.,** Hamilton  
Standard Div., Windsor Locks, Conn.  
Services for support of propellers—  
\$716,103  
Overhaul of aircraft—91—\$40,940  
Servicing of propeller barrels—420 ea.—  
\$149,906

**UNITED AIRCRAFT CORP.,** Sikorsky Air-  
craft Div., Bridgeport, Conn.  
Modernization of helicopters—17 ea.—  
\$151,478

**UNITED AIRCRAFT CORP.,** Sikorsky Air-  
craft Div., Stratford, Conn.  
Conversion kits for converting helicop-  
ters—\$72,513

**VICKERS, INC.,** Detroit, Michigan  
Pump—2 items—\$521,650  
Truck spare parts—24 ea.—\$32,850  
Cylinder booster—250 ea.—\$32,187

**RAY WHITE ELECTRIC PRODUCTS,** East  
Detroit, Mich.  
Spare parts—17,305 ea.—\$38,085

**WILLYS MOTORS, INC.,** Toledo, Ohio  
Light trucks—90—\$146,074  
Engine with accessories—\$871,177

## Take a Look at Formed Tubes

If you have some parts that seem to be out of line in price or are performing poorly, toss the problem to Formed Tubes' engineers. There is no obligation or cost to you; yet the use of formed tubes could make substantial savings for you. Call for a Formed Tubes' representative or write for the new illustrated booklet, "Take a Look at Formed Tubes."

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503 Prairie, Sturgis, Mich.  
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## BOOKS ...

**CONSTRUCTION PLANNING, EQUIPMENT, AND METHODS,** by R. L. Peurifoy, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. Price, \$8.50. This book emphasizes the need for more detailed engineering planning before a construction project is begun. Besides providing text material for students on construction, it is intended to assist engineers and architects in planning construction projects, selecting the most suitable construction equipment, and using the most satisfactory and economical construction methods. Among the special topics treated by the author are: construction stages and layout; keeping records of equipment performance, material costs, and labor costs; engineering fundamentals as they apply to construction; and reducing the cost of excavating and transporting earth. The book is generously supplied with typical examples, tables, and illustrations.

# Now, A Brake As Simple As ...



Auto Specialties aluminum Double-Disc Brakes automatically keep themselves in adjustment. An amazing self-adjusting screw automatically advances the brake lining as it wears. Constant pedal height is always maintained. 100% contact is always maintained between the linings and the metal friction surfaces. Braking is safer all the time.

This self-adjusting screw is a simple, uncomplicated mechanism with no parts to wear out. It moves only a few thousandths of an inch at a time. It performs efficiently under the most severe braking tests.



Ball and ramp. This is the exciting self-energizing principle of the Auto Specialties Double-Disc Brake. It is effective, yet simple. As braking pressure is applied, the actuating discs are forced apart, making contact with the friction surfaces. As the torque increases, the balls roll up the ramps, forcing the discs further apart. With the discs energized, the momentum of the car does 50% of the braking. The ball and ramp self-energizing feature of the brake is simply constructed. There are no complicated mechanisms, no levers to rattle, bend or wear, no parts to break down, nothing to wear out, and movement is only a few thousandths of an inch.



Cooler running. Auto Specialties Double-Disc Brakes are aluminum. Aluminum weighs only  $\frac{1}{3}$  as much as iron. Aluminum has three times the heat dissipating ability of iron. Auto Specialties aluminum brakes get rid of heat fast. Run cooler. Do not fade. The aluminum construction is simple, there are no complicated parts to wear out.

Here is a simple brake, the effectiveness of which has been proven by a series of tests so demanding that no other brake has ever passed them. Auto Specialties engineers will gladly talk cost, production, and delivery with car manufacturers, knowing that this brake is ready for adoption and is priced competitively.

## AUTO SPECIALTIES MFG. CO., INC.

SAINT JOSEPH, MICHIGAN

Manufacturing for the automotive and farm machinery industries since 1908

Plants also at Benton Harbor and Hartford, Michigan and Windsor, Ontario, Canada



This new Minneapolis-Moline Model 445 uses Twin Disc SP-506 ("wet" type) Clutch as live power take-off. Clutch is in transmission proper, and operates in a bath of oil.

## Twin Disc provides specific answers to clutch and power take-off problems on tractors

For more than 30 years, Twin Disc Engineers have worked closely with designers and manufacturers of farm machinery — to provide *specific answers* to their clutch and power take-off problems.

A typical example of this long, successful relationship is the *custom designed* SP-506 ("wet" type—multiple plate) Clutch used as a live power take-off on the new Minneapolis-Moline Model 445.

In addition to farm tractors, such as this, and the Oliver Super 55 — Twin Disc products appear in a number of diversified forms — from clutches in the newest Case Field Forge Harvester to torque converter components in the newest and largest

crawler tractors, manufactured by Allis-Chalmers, Caterpillar and International Harvester.

Twin Disc is prepared to *custom design* clutches for your specific needs — using many standard components to create *minimum tooling charges* and *low unit prices*. If you have a clutch or power take-off problem, write or call Twin Disc Clutch Company, Racine, Wis.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa

## Special Equipment at American Motors

(Continued from page 52)

bly. The connecting rod assemblies are placed on a conveyor with the small end down. As they move on this line, they pass through a chute, served by a small Tocco induction heating machine, where the small end is rapidly heated to a temperature of 375 F. The operator removes the rods quickly and transfers them to the assembly station where the piston is placed over the small end and a plunger from the side presses in the piston pin. This produces a durable press fit which must pass a 2000-lb press load for acceptance.

Finally, it may be noted that a special Gisholt Dynetric balancing machine currently is being used for final engine balance. In this case, the engine is taken off the adjacent final assembly line before the cylinder heads, oil pan, and timing cover are installed, thus constituting a partial assembly. Nevertheless, in this condition the engine contains all rotating and reciprocating parts that contribute to balance.

## BOOKS...

**THE POWER TO GO**, by Merrill Denison, published by Doubleday & Co., Inc., 375 Madison Ave., New York, N. Y. Price, \$5.00. This book traces the growth and development of the automobile industry from its earliest beginnings, shortly before the turn of the present century, to the present. In addition to basic information about the automobile both in Europe and America, the author includes a convincing analysis of the reasons why the industry flourished more rapidly in this country than in Europe. The book is written in a highly readable style and spiced with a subtle humor which does not detract from its authenticity. Christy Borthy, historian of the AMA, collaborated with Mr. Denison in the preparation of the work.

**AIRCRAFT GAS TURBINES**, by C. W. Smith, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$8.75. This volume is a treatment of the fundamental principles of the gas turbine powerplant and is a guide as to its design, testing and installation. Stressing basic theory, it offers an authoritative source of information on the design of components, the calculation, analysis and prediction of performance, the correction of test results, and the presentation of performance data. The material applies to stationary as well as aircraft powerplants.



# Performance Report on the Flying Press-



400 aluminum p.c. plates every minute. Of .02" gauge stock these were formerly pressed at 110 per minute on conventional equipment.

Window channel molding production doubled as Wean Flying Press gives manufacturer 225 feet per minute.

400 E's and I's every minute instead of the 180 made on slower, conventional presses.

## Revolutionary Wean Press continues to amaze the industry

Since it was first introduced to industry, the Wean Flying Press has commanded the interest of imaginative production people. On paper, it looked good. Tests on the hand made prototype were even more convincing. But, could a production model achieve such levels under actual operating conditions?

For the answer—note the typical production figures set down here. In every case, the Wean Flying Press, using standard die sets, has established a performance record.

Why not acquaint yourself with this amazing press now? Contact the Wean Sales-Engineer in your area or write direct.

# Wean

**EQUIPMENT CORPORATION**

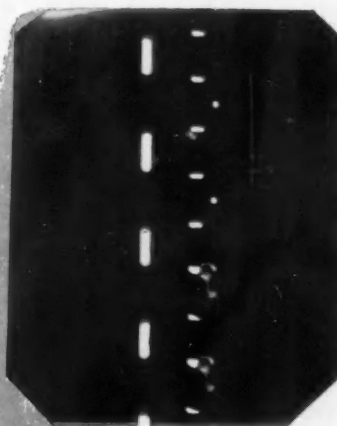
CLEVELAND • CHICAGO • DETROIT • NEWARK, N. J.

Cable: WEANCOR

**Wean**



Shallow draw and punch work on .065 gauge stock boosted to 400 pieces per minute by Wean Flying Press.



# Industry's Evaluation of Electric Heat

By Robert E. Morken  
Chrysler Corp.

**T**HE choice between electrically heated equipment and gas fired equipment is usually determined by economic factors in a given location. In some areas the cost of electricity is such that it becomes the normal choice for heating requirements. In

other locations, electricity is prohibitively expensive for normal operations and gas becomes the favored fuel. Most of Chrysler Corporations plants are located in areas in which the latter is more or less the rule, and we have determined that it costs approxi-

mately three times as much to heat furnaces electrically as it does to heat with natural gas. Hence, we normally specify gas fired furnace equipment, all other factors being equal. This choice covers most of our annealing, carburizing, and hardening furnace equipment. However, certain electrically heated applications are preferred for reasons other than basic differences in power and gas rates; in other words, we find we can do certain things with electrically heated equipment that would be more difficult or more costly to accomplish by other means.

Let us consider first the heat treating equipment required in the laboratories and tool rooms. These furnaces are almost invariably batch type and fall within approximately the same physical dimensions. Also, the way in which tool room and laboratory furnaces are used make them applicable for the same comments. We have a decided preference for electric heat in this type of equipment. The use of electricity in this case provides for considerably greater temperature ranges in a single piece of furnace equipment than could be obtained with gas firing. We have such furnaces that can be operated within decent temperature variation tolerances from 350F to 2400F. This is very difficult to accomplish with gas heating. Furthermore, this type of furnace is usually operated on a periodic basis. It may be used this morning, and not again until 48 hours later, or it may be used on first shift only. Hence, it is economical to cool off the furnace between jobs. We find it is much easier and far safer to do this with electrically heated furnaces. In other words, we tend to prefer electric furnaces for jobs that are not continuously operated. They require no special skill or attention in starting up or shutting down. They can be powered to come up to heat quickly and yet have the versatility of wide temperature ranges. In addition, electric furnaces of this type can be built to attain a far higher temperature than can economically be attained by gas firing. Here then is one of the ideal applications for electric furnaces.

We use a considerable number of salt bath furnaces. At one time, these furnaces were all gas fired and used a highly alloyed and very expensive cast pot to contain the molten salt. Premature pot failure, especially with the neutral chloride base salts, was the rule. Every time a pot failed prematurely the furnace combustion chamber lining became saturated with

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**DURABLE**

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**POWER TAKE-OFFS**

A complete line of low speed, medium speed, high speed, reversible, and three series of two speeds forward, reversible models for every truck requirement.

**FEATURING:** strong, light-weight housings; forged, heat-treated gears; heat-treated shifter yokes; anti-friction bearings throughout, shaved gear teeth; double-lip shifter shaft seals, extremely low prices, nationwide distribution and service.

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## **BCA offers... Superior Bearing Performance...plus Manufacturing Flexibility**

In even the toughest applications you can count on BCA ball bearings for outstanding performance . . . just as you can count on BCA for the manufacturing flexibility to fill both your routine and emergency needs.

For example, BCA Conrad type single row, deep groove radial bearings sustain combined radial and thrust loads or thrust loads alone—in either direction—even at extreme speeds.

Design features of these bearings include use of largest size balls for optimum ratio of ball diameter to bearing race section at points of heaviest stress . . . deep, uninterrupted ball raceways, precision-ground to conform closely to ball curvature . . . high shoulders on inner and outer raceways to support balls laterally and permit bearing to carry thrust loads equal to 100% or more of the radial load rating.

Call on BCA. We have the experience, the skilled personnel and the facilities to meet your bearings needs . . . under both ordinary and unusual conditions.

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a molten salt. A pot failure, therefore, necessitated a complete rebricking of the combustion chamber as well as replacement of the expensive alloy pot. This condition had become almost intolerable when the electrode salt bath furnace was introduced. We have converted our salt bath equipment to the electrode type with but few exceptions, have saved many thousands of dollars in so doing. Perhaps the first electrode salt bath installation we made was in the tool room where equipment was purchased to harden high speed steel. The high speed steel

had formerly been hardened in semi muffle type furnaces at temperatures in the range of 222 F to 2325 F. Decarburization was a great problem in this equipment, especially with the molybdenum high speed steels then gaining favor. The electrode salt bath furnaces immediately solved the decarb problem and have been operating efficiently and economically ever since.

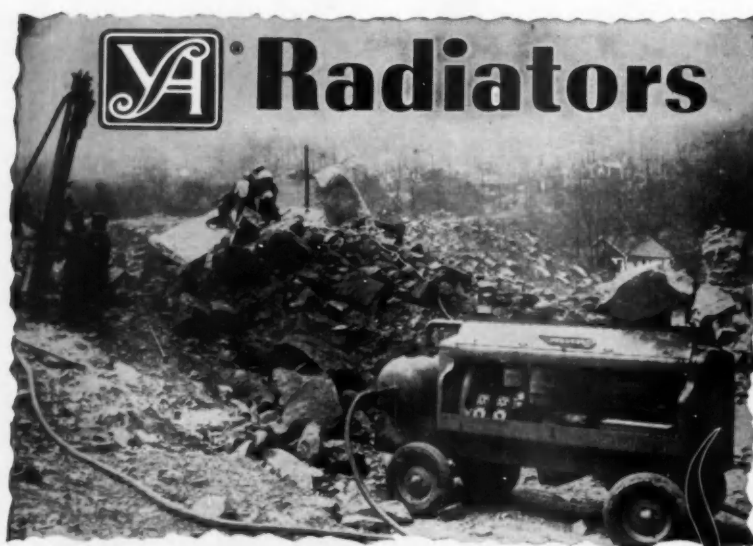
Later we began replacing our gas fired salt pots with the electrode type for maintenance reasons. In so doing we found that we had alleviated a bad ventilation problem as well. It is

much less costly to ventilate electric furnaces than it is to ventilate gas fired furnaces. Sometimes this may be the determining factor in the selection of equipment.

Continuing with salt baths, another use for which the electrode salt bath is admirably suited is in controlled distortion work. This type of equipment is extremely adaptable for austempering and martempering. With the increased necessity for more and more precision parts required in today's products, it is a safe prediction that the electrode salt bath will become increasingly important in our heat treat planning. This type of equipment lends itself well to automation and can readily be located in machine line sequences. Such a location is advantageous, of course, because it saves in material handling costs.

Since cost reduction is an ever-present problem, everything possible to minimize distortion during heat treating operations must be done. Distortion is costly and necessitates expensive straightening operations. Therefore, we are thinking more and more in terms of austempering and martempering close tolerance precision parts. Both these processes require quenching baths to be operated at elevated temperatures in the range of 350 F to 1100 F. The electrode salt bath furnace fits these requirements to our satisfaction, and we are today using this type of equipment to austemper and martemper certain critical parts on a production line basis with a high degree of success. In fact, the result is a freedom from distortion, and attainment of physical properties unattainable by any other known method.

There is another metal treating problem for which we have found electric furnaces to be the best adapted to the job requirements. This is in the high temperature field of sintering and copper brazing. Let us consider both these applications in the same category for the moment because of their similar high temperature requirements. We are now talking about temperatures in the range of 1800 F to 2100 F, with a few requirements going on up to as high as 2600 F. In all cases, highly reducing atmospheres are required within the furnace chambers and therefore, we must think in terms of furnace construction that is sealed to the atmosphere. This can be accomplished in gas fired equipment by the use of direct fired muffles, or by use of radiant tubes. It is easily accomplished in electric furnaces by the use of either nickel-chrome alloy



## ...do double duty on portable air compressors

As the picture shows, YA Radiators do time on the rock pile, too! As standard equipment on many of America's most rugged portable air compressors, these Yates-American Radiators and Intercoolers fill the important job of cooling both the hard-working engines and the air they compress. Yates-American builds quality radiators for motor trucks, industrial trucks, tractors, locomotives, power plants—offers products for every heat transfer use. Give us your requirement ... we'll show you how we can help you.



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## Why nearly half of today's trucks use engine control systems by Holley

Maximum power at minimum cost. This is the reason more than half of America's major truck manufacturers — among them Ford, GMC, International Harvester and White — factory-equip their engines with control systems by Holley.

For over fifty years Holley has built carburetors, distributors and other engine components integrally designed to provide top performance at lowest operating cost. The now-widely-used 4-barrel carburetor with governor, for example, is one of a number of Holley engineering

firsts originally designed, developed and manufactured by Holley for the trucking industry.

Truck, automobile and aircraft engine producers have proven that wherever engine control systems are needed—for main or auxiliary motors—Holley's half century of design, engineering and manufacturing experience sets the standard.

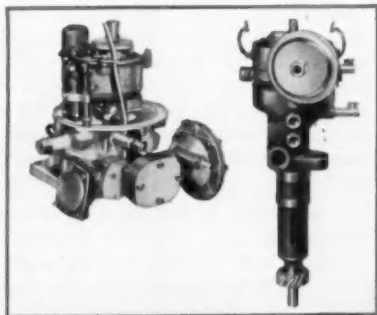
When your requirements call for maximum engine performance at minimum operating cost, specify Holley engine control systems. Many aircraft manufacturers; more than ten million

automobiles; and over half of the nation's leading truck producers do.

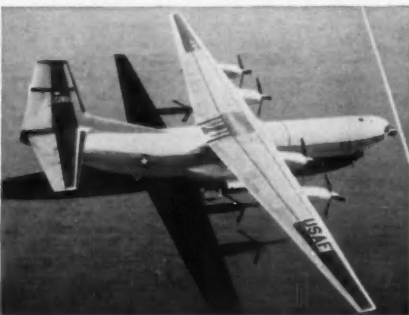


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*For more than half-a-century—original equipment manufacturers for the automotive industry.*



**IN TRUCKS**—manufacturers combine Holley's carburetor, distributor and governor for an integrally-designed control system providing maximum power and economy.



**IN PLANES**—specially-designed power control systems and other precision parts by Holley contribute greatly to safe flying by making many necessary engine adjustments automatically.



**IN AUTOMOBILES**—more than ten million of them now on the road are using carburetors, distributors, heat regulators designed by Holley for finest performance.

ribbon heating elements, or bonded silicon carbide rod type elements. Several attempts have been made to construct gas fired equipment of both muffle and radiant tube design to fulfill the requirements of such high temperature atmosphere work. To date, I know of no outstanding success achieved along these lines. We must await the development of alloys capable of withstanding such high temperatures for longer periods of time before it will be economically feasible to specify gas fired furnaces for these applications. Hence, our best answer

today lies in the use of electric furnaces. For these purposes we have in the past installed many ribbon element furnaces. Lately, however, we have begun to use increasing numbers of the silicon carbide type elements. We tend to prefer the latter because of the ease in changing elements, and the minimum of down time that such ease of changing permits. By properly zoning such furnace equipment, very uniform temperature control can be attained, and this is a definite advantage in the type of work usually run in these furnaces.

As an example, let us discuss torque converter brazing. In this particular job we are copper brazing blades of 0.030 in. thickness to torus rings of 0.060 in. and shrouds of 0.120 in. all in the same assembly. To furnish the source of copper we use highly refined cuprous oxide carried in suspension in a specially compounded hydrocarbon vehicle. This cuprous oxide is sprayed automatically on the parts to be joined by copper brazing. The sprayed assemblies are then inverted on supporting fixtures resting on fabricated trays which are charged automatically into the brazing furnaces. Now, with metal sections of three different gages entering the furnace at the same time, a very unequal expansion is going to occur. Hence, the rate of heating is extremely important and must be accurately controlled. I know of no better way to do this than by the use of large numbers of heating elements so connected as to provide for great flexibility in power input. Then, too, we have found that the cuprous oxide must be substantially reduced to metallic copper before a temperature is attained sufficient to melt copper. If the melting point of copper is reached while quantities of unreduced oxide remain, the molten copper absorbs the remaining oxide. Once the oxide is absorbed into the molten copper it is next to impossible to accomplish further reduction. The net result is a very sharp decrease in joint strength. Therefore, throughout this particular brazing operation, closely controlled time and temperature relationships must be maintained. This we have been able to do with a high degree of success in an installation of four silicon carbide element furnaces comprising a connected load of 1800 kw. The largest of these furnaces is constructed in four zones of control using eight pyrometers to control input to 26 individually adjustable circuits.

In sintering work we have begun to take advantage of the lower unit costs of gas, however, and our more recent installations provide for a gas fired radiant tube preheat chamber ahead of the electrically heated high temperature chamber. A number of economies are involved in this type of construction, and the marriage of the two rivals seems to be quite compatible.

I mentioned briefly that we were working in this field with temperatures as high as 2600 F. This work also requires reducing atmospheres, and furnace construction for these requirements poses some inordinately

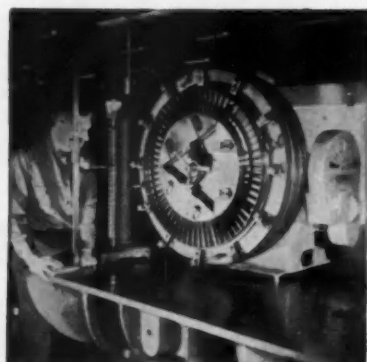
## ROTABS Beat Precision Inspection Costs...



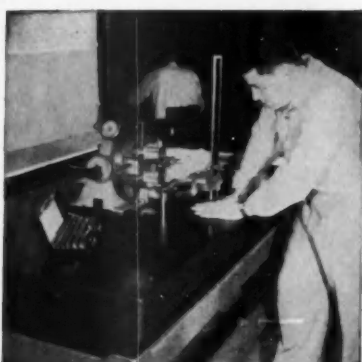
This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.



Checking big jet engine assemblies is fast and simple on ROTABS (36" & 48"), eliminates costly fixtures made obsolete by engineering changes.



Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.



For small parts inspection this 12" universal ROTAB minimizes setup and inspection time, does not require power for tilting and rotation.

*For complete data on the optical precision readings you get with the ROTAB at the lowest cost, write:*

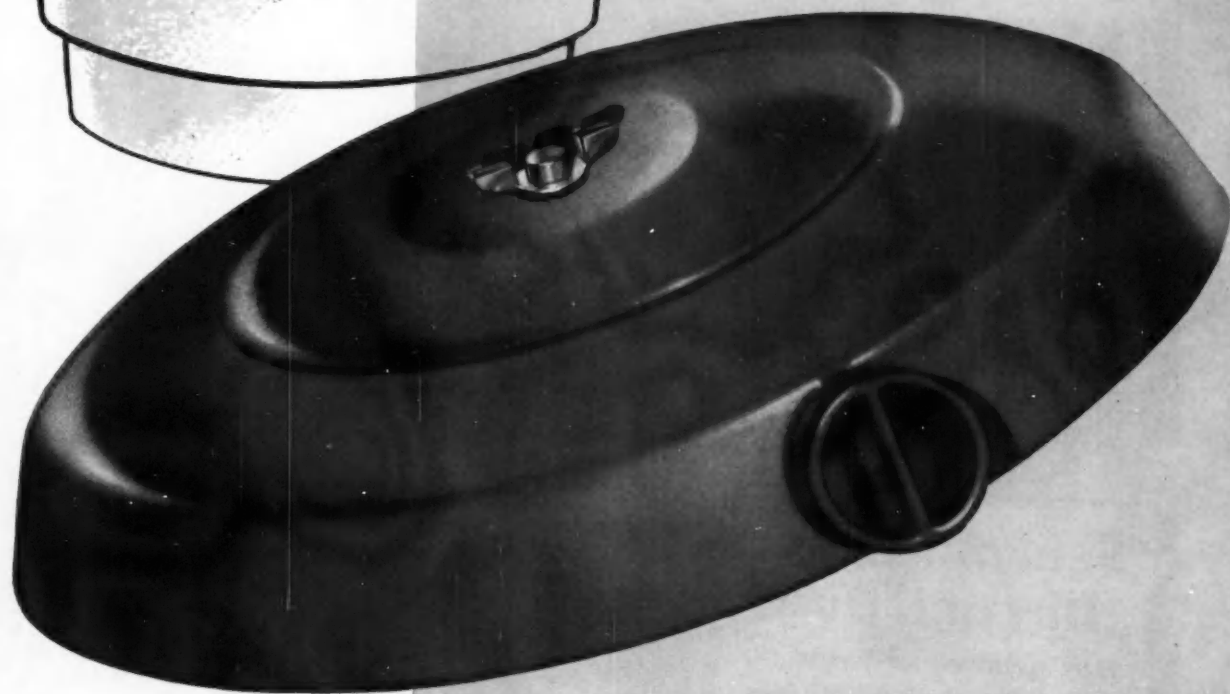
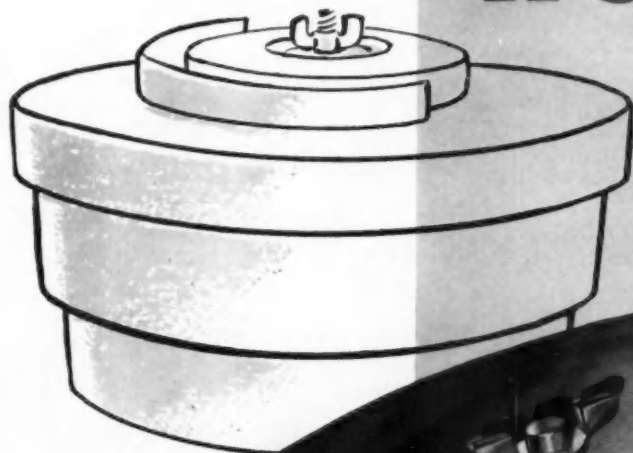
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Conduit Tuning for air cleaner-silencers...an exclusive Houdaille development...makes possible units of lower height to fit under modern low hoods. It's a simplified tuning system that helps reduce costs, too. What's more, it eliminates noises over a wider range of frequencies than resonator-type silencers...does not require the same critical tuning to specific frequencies.

Houdaille's complete and modern engineering and research facilities for designing and testing air cleaners and silencers are at your service in producing units of any type for your specific requirements.

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complex problems. A certain degree of success has been achieved through the use of full muffle furnace construction utilizing molybdenum elements exterior to the muffle. Since molybdenum oxidizes readily at the temperatures necessary for this work, it is necessary to protect the elements from air. In certain applications the atmosphere used to protect the elements is not compatible with the atmosphere required inside the muffle, and extensive precautions must be taken to prevent mixing atmospheres. For this reason we have conducted a large

amount of research toward designing a better element and it appears as if we are about to attain success. These elements consist of a molybdenum wire element encased and permanently sealed into a refractory tube corresponding in size to the silicon carbide elements. Such an element has virtually eliminated the atmosphere problem, is easy to change, and can be grouped readily into required zones for close temperature control. A further advantage occurs from the ready adaptability to gas rich or carburizing atmospheres which do not harm

the heating element.

There is another place where electric furnace equipment fits very well into our operations. Ours is a rapidly changing industry, and our production facilities are subject to frequent changes and relocations. Hence, we often find ourselves with a heating problem in a location where there is no gas distribution system. Since electric power distribution systems pretty well blanket our plants, the obvious answer lies in the use of electric furnace equipment. We recently encountered a rather unique example of this type of application. It was discovered that a certain amount of rejected parts were being run on highly automated machining operations immediately after changing cutting tools. The tool setups were checked and rechecked against master gages until the dimensional variations were traced to a difference in temperature between the new tools and those that had been just removed. Now, we don't ordinarily run gas distribution systems throughout our machine shops, so we are placing small electric ovens at such locations to bring cold tools up to the operating temperature of tools cutting metal, thus eliminating rejects from this cause.

In the early 1940's we entered an extensive research program directed toward possible applications of induction heating in our operations. A laboratory was appropriated and completely equipped with both low and high frequency power sources. Right from the start of this program we found applications of induction heating that resulted in almost astronomical cost savings, and we are continuing to find such applications even today. We have, in the meantime, learned a lot about induction heating. We now have a reasonably good idea of where it can be economically applied and where it can't be. We've learned, for instance, that the geometry of the piece being heated has a vital bearing on whether or not we can use induction. We've learned not to attempt to apply induction heating for surface hardening as cast or as forged surfaces because the dimensional tolerances involved are so great as to completely upset the closely controlled time-temperature relationship necessary for successful induction hardening. We've learned that induction equipment fits very well into mechanized production lines. The equipment is cool to work around, it is easy to ventilate, it is easy to automate, and it does not occupy much space.

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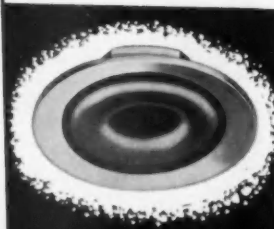
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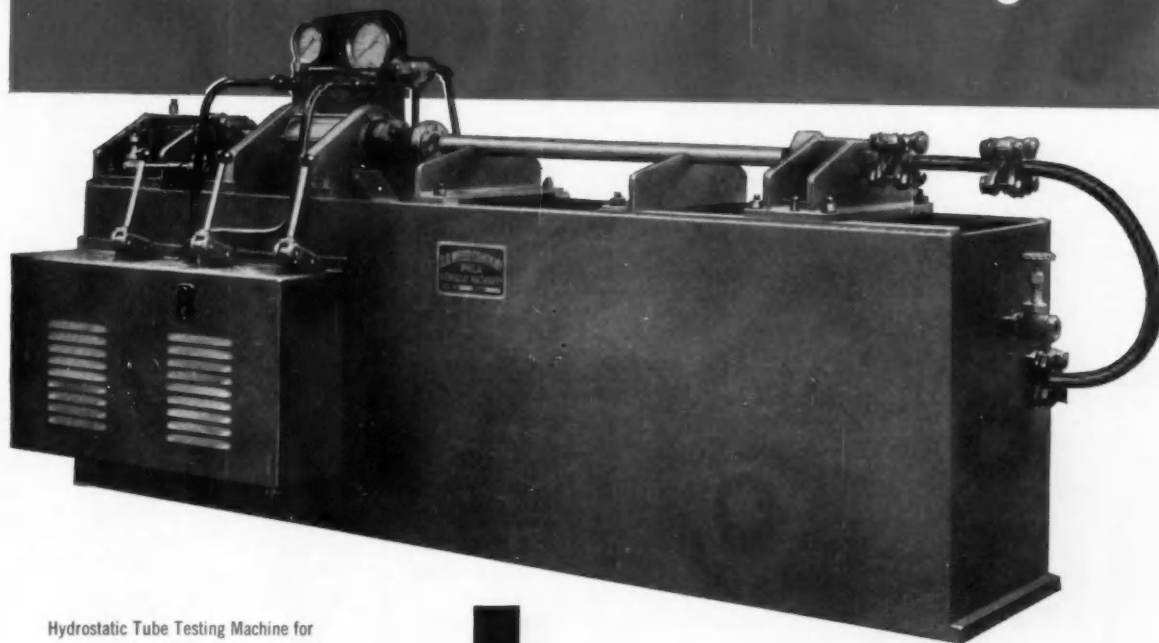
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L-4

in the category of surface hardening. It is here that we have found the most economies. In general, heat can be put into steel at a rate of approximately 50 Btu per sq in. per minute by furnace heating, at about 150 Btu per sq in. per minute by high intensity flame heating, and at from 600 to 900 Btu per sq in. per minute by induction heating. I think these input rates illustrate the adaptability of induction heating for surface hardening work. In induction surface hardening work, the heated depth is affected by coil design, the heating cycle time, and frequency of the power source. Frequencies in cycles per second of induction equipment vary from 60 cycles to 1,000,000 cycles. The effect of frequencies on heat penetration is shown by the accompanying table.

Cycles/Sec. Cycles	Theoretical Penetration inches	Practical Penetration
60	2.80	about 3 inches
960	0.70	" 1 "
3,000	0.035	" 0.060 "
9,600	0.020	" 0.040 "
120,000	0.006	" 0.030 "
500,000	0.003	" 0.020 "
1,000,000	0.002	" 0.010 "

Induction heating creates heat in steel principally by means of I'R losses due to the resistance of the steel to the flow of the electrical energy induced beneath the steel surface. The practical cases obtainable differ from the theoretical because of heat conducted into the steel as it is being heated. Hence, the time of heating has a considerable effect on the final case depth. Most of the equipment sold today for induction hardening is either 9600-cycle obtained with a motor generator set, or 500,000-cycle obtained with an oscillator tube set. We have found that for the most practical and economical operations we should not attempt to heat to a depth in excess of 0.060 in. with oscillator tube equipment. When we attempt to do so, the power input becomes excessive, cycle times increase beyond decent limits, there is great danger of overheating the steel surfaces resulting in cracks and poor metallurgical properties.

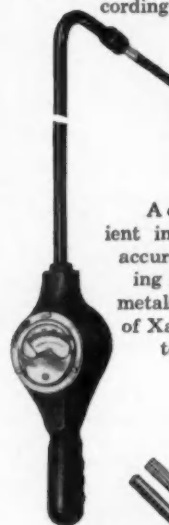
The first installation of induction hardening at Chrysler Corp. was a 9600 cycle motor generator set tooled to surface harden the bearing journals on crankshafts. That set is still in operation today and was the forerunner of the many installations to follow. Quite logically, because of design geometry, we first concentrated

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## It's 196X in your engine lab...

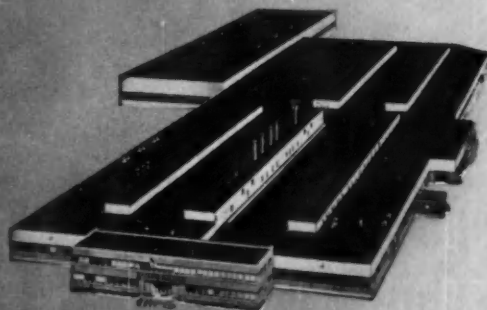
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Another example, 3 types of valve rotation systems to add thousands of extra miles to the valves in your high-performance engines.

Thompson is continually experimenting with new and better valve steels, and valve-train components to keep valve engineering apace of engine developments.

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on such symmetrical objects as king pins, water pump shafts, differential pinion shafts, shock absorber piston rods, transmission main shafts, etc. As we accumulated more knowledge, we started to induction harden such things as fly wheel ring gears, water pump drive gears, gearshift forks, gearshift rails, transmission countershaft gears, and many more parts of a rather complex nature. Our more recent installations involve such products as rear axle drive shafts, steering knuckles, connectors for the power steering units, torque converter trans-

mission countershafts, intake and exhaust valve rocker arms and rocker arm shafts. We have made induction hardening installations too numerous to mention, but I would like to point out the salient features relative to the economies on a couple of selected jobs. For instance, in the case of the steering knuckles, we were using an alloy steel. The alloy forging was heated, quenched, and drawn to a hardness of 255-321 brinell. The steering knuckles were then machined, ground, and finished. Today we are using a plain carbon steel, AISI-1046,

and normalizing the forgings to a hardness of 229-268 brinell. The knuckles are then rough machined after which the critical fillet areas are induction hardened and tempered to a hardness of 42-47 Rockwell C. The parts are then ground and finished. By the outlined changes we have improved machinability, greatly increased the fatigue strength of the knuckles by using a higher hardness in the critically stressed areas, and have in the complete change wound up with a substantial cost savings per part. The savings is accounted for principally in the difference between the cost of plain carbon steel and the cost of alloy steel formerly used. Similar savings were involved in changing materials on rear axle drive shafts allowing for the use of induction case hardened shafts instead of the through hardened alloy steel shafts formerly used. We see a great future in this type of thinking where we can use a less costly material to perform a function, and with the help of induction hardening actually achieve superior physical properties with a savings in product cost.

There is another quite unique application we have found for induction heating. The drive pinions in automotive rear end sets are carburized and quench hardened to Rockwell C 58 minimum. This gives the drive ring gear the necessary hardness to withstand wear from millions of revolutions. However, the thread end of the pinion, which attaches to the drive shaft, is subject to severe torque and must be drawn back to a tough structure to prevent brittle failure. This used to be accomplished in lead pots, by immersing the thread end in molten lead and gave a nice sharp line of demarcation between the tough threads and the areas required to be very hard. However, lead pots are messy and hot to operate and if the lead is even the least bit dirty it sticks to the steel immersed in it. This required wire brushing to remove the lead and wire brushing is expensive. While we were experimenting with induction we thought about this tempering problem a great deal and finally built up an induction tempering unit powered by a 560 cycle motor generator set. The power rating and frequency were so selected that a maximum temperature of 1200 F could not be exceeded and hence the time factor was eliminated from the cycle. This low frequency induction unit solved the problem completely.

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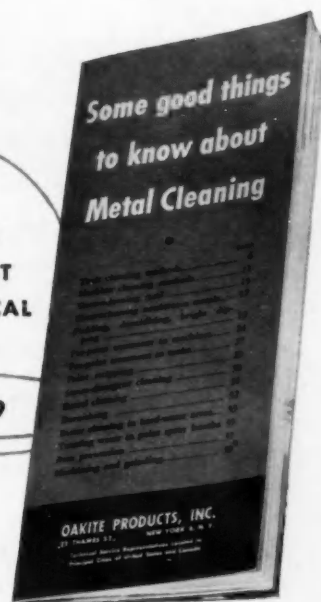
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Can one cleaning material do all metal-cleaning jobs? *See page 5.*

What kind of cleaner attracts both oil and water? How does this help remove buffing compound residues and pigmented drawing compounds? *See page 8.*

Why clean ferrous and nonferrous metals in separate tanks? *See page 10.*

What are the advantages of reverse current for electrocleaning steel? *See page 15.*

For electrocleaning nonferrous metals, what are relative advantages of cathodic, cathodic-anodic and soak-anodic cleaning? *See page 17.*

Can you electroclean brass without tarnishing? *See page 18.*

How do bright dips make metals brighter? *See page 21.*

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet? *See page 24.*

Would you like a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? *See page 28.*

What's the best way to clean parts that are too large to be soaked in tanks or conveyed through washing machines? *See page 30.*

Does your burnishing barrel produce a luster you are proud of? *See page 32.*

What do you do when the overspray neither sinks nor floats in the wash water in your paint spray booth? *See page 35.*

Do you dry steel parts before anti-rusting? *See page 37.*

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60 cycle power in this case, to expand flywheel ring gears to enable assembly to the flywheel. Sixty cycle power is very satisfactory for applications such as this and is readily obtainable from a used welding transformer, which most plants have available.

Let us look for a moment at an entirely unrelated application of electrical heating. Some years ago we decided, in view of the existing tight aluminum market, that we would have to control our aluminum alloy scrap in order to keep our piston foundry in operation. At the time we were generating approximately 20,000 lb per day of aluminum scrap in the form of turnings from castings we were machining. We decided to install facilities to reclaim this scrap and cast it in the form of refined ingot for use in our foundry. After studying all the possibilities, low frequency 60 cycle induction melting equipment was selected to melt the aluminum chips. This furnace facility has been in continuous operation for over nine years with a net melt loss that has consistently been between four and six per cent. I know of no gas fired equipment that can come close to approaching such a remarkable figure. The secret of such a low melt loss in the induction furnaces seems to be in the inherent stirring action present. Chips are fed in at a controlled rate by means of electrical vibrating feeders. The rate of chip feed is controlled to be identical with the melting rate of the furnace, which, with its moderate bubbling action, melts the chips as soon as they contact the bubbling metal. Hence the chips cannot stand on top of a hot bath of molten metal and burn up. This I consider to be an outstanding example of the economies involved in selected applications of electrical heating—regardless of the initial unit cost of the electrical energy compared to gas.

We have other melting requirements for which electric furnaces were selected because of their adaptability to the job requirements. Electric arc furnaces are used to melt metal for cast iron camshafts. Electric induction furnaces are used to melt alloyed steel for armament castings in another foundry. Electric furnaces are used to melt highly alloyed ferrous metals in our precision casting foundry. Frankly, in my considered judgment, we could not have economically done these jobs by any other means. We have begun to play around with some vacuum melting equipment. Of course, the furnaces are electrically

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**PLASTICS FOR CORROSION-RESISTANT APPLICATIONS** by R. B. Seymour and R. H. Steiner. Shows engineers how to select the right plastic for construction in corrosive atmospheres; the use of plastics as protective coatings, organic linings, chemical resistant mortar cements, casting resins, plastic foams, impregnants, industrial silencers and reinforced materials. Plastics available for a specific application are compared in tabular form for quick, easy selection of the most suitable material. 1955, \$7.50

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**MOTOR OILS AND ENGINE LUBRICATION** by Carl W. Georger. Describes in great detail the methods of testing and evaluating performance characteristics of motor oils. Includes detailed specifications covering various types of engine tests, properties of lubricants (ash, carbon residue, pour point, color, etc.). Covers chemical and physical properties, application of motor oils and the relation of oils and lubrication to engine design, operation, maintenance, breakdowns and failures. 1950, \$9.50

**FABRICATED MATERIALS AND PARTS** by T. C. DuMond. A comparison of cost and design factors to help you select the right metal-forming methods for the greatest economy in manufacturing small industrial parts. Contains a valuable fold-out chart (over 2 1/2 feet long) showing at a glance the cost, design and production comparisons between various manufacturing methods. This chart alone is worth many times the book's cost to production men. 1953, \$6.50

**TOOL ENGINEERS' DATA BOOK** by G. J. Gruen. Contains all of the tables, formulas, constants and specifications needed by the practicing tool engineer and designer. Contains amazingly complete data on the heat treatment of special alloys and stainless steels, spot identification of metals, alloys and plastics, and a vast amount of other hard-to-find information. 1953, \$5.50

**RESIDUAL STRESSES IN METALS AND METAL CONSTRUCTION** Edited by W. R. Osgood. Describes and evaluates the effects of residual stresses upon the performance of various kinds of structures. Covers the origin, magnitude, distribution, etc. of all types of residual stresses existing in a structure or machine arising from welding, machining, or other causes. 1954, \$10.00

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heated. How else would you do the job in a vacuum?

The applications that have been discussed are advantageous to us in locations involving electric power rates of \$0.013 per kwh and natural gas at \$0.054 per therm. My imagination could well run away with me if I thought of all the possible applications for electrically heated furnace equipment in an economy of decreased electric rates. With the rapidly approaching possibility of atomic powered generating facilities, we may well be on the threshold of such an economy. When and if such does occur you can rest assured that we at Chrysler will welcome the opportunity to use more and more of the easily controlled versatile electric furnaces that we cannot afford to use today.

## BOOKS...

**FUNDAMENTALS OF PRESS TOOL DESIGN**, by W. F. Walker, published by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. Price, \$4.75. The author has aimed in this book to identify and explain the fundamental requirements which must be known and understood for each press operation in order that tools efficient and economic in operation can be designed. An instructive chapter on cutting is followed by information on the designing of tools for over twenty press operations. The calculation of blank sizes is covered, with the addition of worked examples of areas for non-circular parts. In the final chapter, data are provided on materials suitable for varying types of press tools, conditions and quantities.

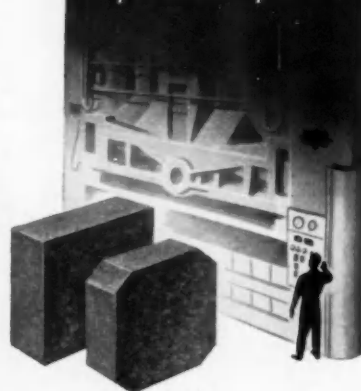
**BIG BUSINESS LEADERS IN AMERICA**, by W. Lloyd Warner and James Aegglen, published by Harper & Bros., New York, N. Y. Price, \$3.75. Presented in this interesting study is an absorbing group portrait of America's top executives and the forces that put them where they are; in short, it is a revelation of business success in America. The authors have examined the careers and backgrounds of over 8000 business leaders in an effort to find the keys to their successes. The book is a study not only of social and occupational origins but of psychological backgrounds and motives as well. It is designed to discover what kind of men are today's business leaders, how they climbed to success, why they succeeded, and what significance the facts of their lives hold for American democracy.

**THE MMH MATERIALS HANDLING MANUAL**, published by Boston Publishing Co., Inc., 795 Boylston St., Boston 16, Mass. Price, \$5.00. Covering all phases of materials handling, this publication was designed as a basic reference and working text. It is divided into seven sections dealing respectively with the overall problems of handling; plant layout and operation; warehousing and indoor storage; outdoor storage and yard handling; pallets, unit loads and packaging; shipping and receiving; and handling special shapes. The material is written primarily from an engineering standpoint, with emphasis on methods as well as applications. Contributors, comprising in all over 30, include well-known men from industry, materials handling consultants, university educators, and Government specialists.

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World Bestos RED BLOCK Combination reduces glaze, eliminates "fading"; assures full friction at high temperatures.

**Find out how you can save time and money in your own production processes!**

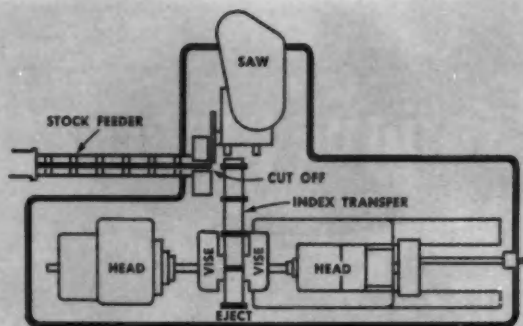
RED BLOCK'S dependable, trouble-free performance and longer wear pay big dividends. Write today for complete information on World Bestos RED BLOCK Combination for industrial brakes in your plant.

**WORLD BESTOS**  
NEW CASTLE, INDIANA

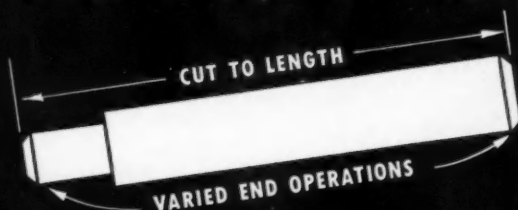
DIVISION OF THE

**Firestone**  
TIRE & RUBBER CO.

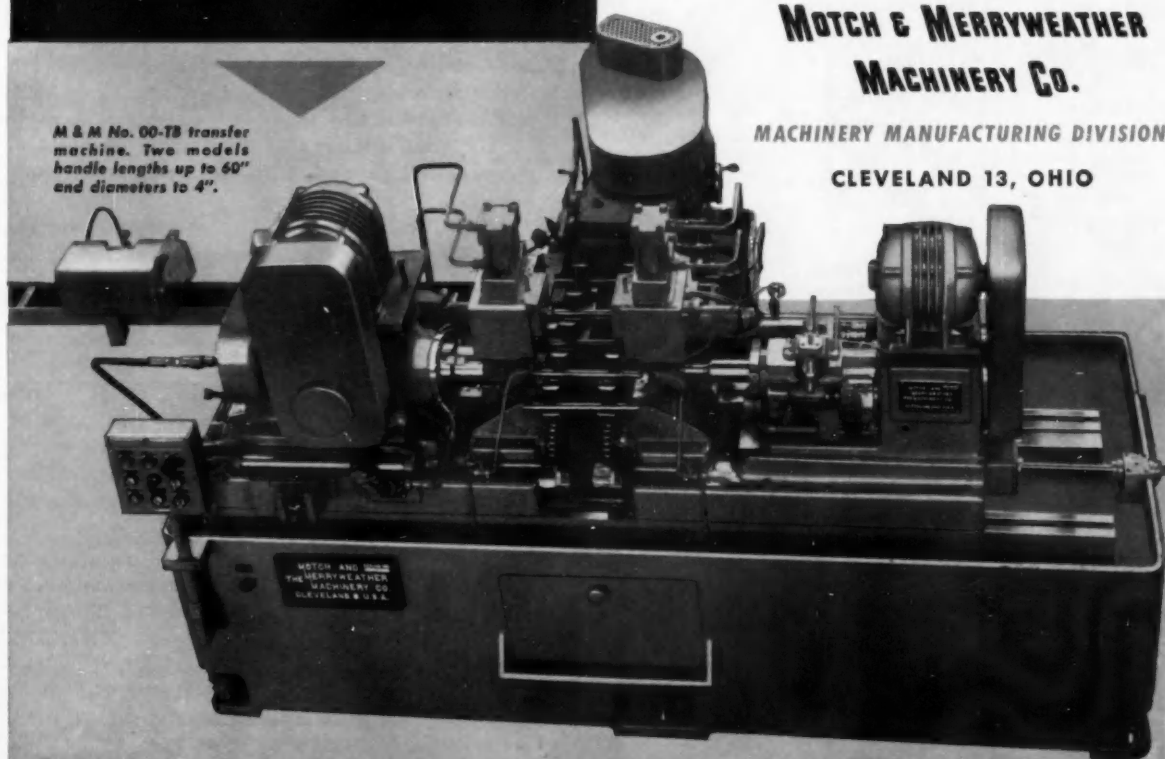




## *Simultaneous* STOCK CUT OFF and DOUBLE END MACHINING



M & M No. 00-TB transfer machine. Two models handle lengths up to 60" and diameters to 4".



**BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, AND SPECIAL MACHINERY**

## HOT BED OF ACTIVITY

Motch & Merryweather's new transfer machine widens the horizon for the simultaneous double-end machining of bar stock or tubing. Combined with cut-off to accurate length are: centering, chamfering, turning, drilling, or boring. Box mill turning is performed along with center drilling and chamfering. From stock pile to discharge, all operations can be fully automated. For the quickest answer to speed your stock processing, send us your part drawing.

### THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

International Products & Mfg. Co.

switched to La Salle

**fatigue-proof**

STEEL BARS

## TO MAINTAIN UNIFORMLY HIGH QUALITY



NEWLY PUBLISHED!  
Get your copy of this 20-page  
booklet which gives detailed  
information on the remarkable  
new "FATIGUE-PROOF."



**La Salle STEEL CO.**

1438 150th STREET, HAMMOND, INDIANA

Manufacturers of America's Most Complete  
Line of Quality Cold-Finished Steel Bars

Please send me your "FATIGUE-PROOF" Bulletin.

name \_\_\_\_\_  
title \_\_\_\_\_  
company \_\_\_\_\_  
address \_\_\_\_\_  
city \_\_\_\_\_ zone \_\_\_\_\_ state \_\_\_\_\_

International Products & Manufacturing Company is now specifying "FATIGUE-PROOF" steel bars for generator and starter shafts. These are heavy-duty shafts. Formerly they used 4140 or 8640 heat-treated.

Field failures can be anticipated unless the finest of materials and the best of manufacturing practice are employed.

"FATIGUE-PROOF," by eliminating heat-treatment, does away with any possibility of quench cracked shafts getting past inspection. Since no straightening after heat-treatment is required, unfavorable residual stress due to severe straightening operations cannot be present.

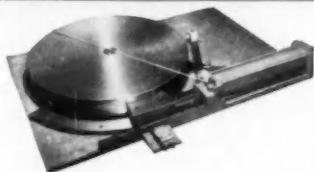
It's another case where "FATIGUE-PROOF's" high strength in-the-bar eliminates a possible cause of trouble.

If you want to improve the quality of your products and avoid the problems of machining or heat-treating parts from high strength carbon or alloy steels . . . try a sample bar of "FATIGUE-PROOF." If you will give us application details, send a blueprint, or call La Salle Sales Engineer at REgent 4-7800, Chicago, Illinois, he will send you a test sample if it appears "FATIGUE-PROOF" can be used to your advantage.

*International Products & Manufacturing Co., of Chicago,  
are manufacturers of automotive starter  
and generator parts.*

## AIR-HYDRAULICS

### LARGE INDEX TABLE HAS MECHANISM OUTSIDE!



**MAKE ADJUSTMENTS** or remove working parts, in minutes, without ever touching the tooling or table itself. All turning and locking mechanisms are on the outside for ready accessibility. Positive accurate index is assured everytime. Cushioned stop prevents wracking jar. Cushion and index speed are both adjustable to compensate for variations in speed and load weight or size. Table will handle loads with diameters larger than the table and almost any weight.

**MAY BE EQUIPPED** for either air or hydraulic operation. 60-175 lbs. line pressure will do it for air. Sizes from 20-48 inches in diameter with six or more stations. If you need a large dependable table and want the minimum of maintenance and downtime, ask about Air-Hydraulics Model 48.

WRITE TODAY FOR NEW AIR-HYDRAULICS' CATALOG COVERING PRESSES, INDEX TABLES, HAMMERS AND ALLIED EQUIPMENT.

## AIR-HYDRAULICS

### CUSHIONED STOP... FOR ACCURATE INDEX

AIR CYLINDER CUSHION CONTROL  
AIR SPEED CONTROL



**HERE'S YOUR ANSWER**, if accuracy and dependability are important to you. Cushioned stop eases work to position. Locking cylinder stops the table "on the money" and holds it until released by locking dog. Changes in loads, diameters or speeds are no problem either, since both speed and cushion are adjustable. Top plate is 15" in diameter but the rugged mechanism will handle much larger work loads. Table will make up to 100 indexes per minute with a 22" diameter, 200 lb. load.

**OPERATES** on 60-175 lbs. pressure when equipped for air but table is available for either air or hydraulic operation. 4, 6, 8, or 12 stations are standard but others, up to 30, are made to order.

REPRESENTATIVES:  
SOME TERRITORIES STILL OPEN.  
WRITE FOR INFORMATION.

**AIR-HYDRAULICS**

204 BELDEN ROAD  
JACKSON, MICHIGAN

## SHORTIES

Fifty years ago a motorist making a 100-mile trip had to figure on one or two flat tires. Today, he may drive thousands of miles without even a puncture because of the strength and wear resistance of the modern tire.

In addition to rubber tires, the modern automobile uses an average of more than 550 rubber parts, weighing more than 100 lb.

Whereas the automobiles of 1940 required 142,400 tons of glass production, they demanded 414-200 tons in 1955.

Numerous authorities believe that 100-octane gasoline for automobiles will be common throughout the U. S. by 1960. They also assert that average automobile engine horsepower will rise to about 245 from the present 205, and average compression ratios to 10:1 from the present 8:4 by 1960.

Steel companies are scheduled to spend a record \$1.2 billion for expansion and improvement during 1956. They spend a total of \$7 billion for the purpose in 1946-1955 inclusive.

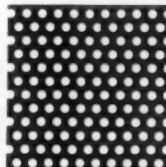
U. S. farmers in 1920 spent \$182 million on gasoline and other petroleum fuel and oil. In 1954, however, this expenditure was up to nearly \$1.5 billion.

Today, compared to 1950, farms in the U. S. have: 1,076,992 more tractors; 491,861 more motor trucks; 265,376 more grain combines; 251,893 more pickup balers; and 231,917 more corn pickers.

Nearly 10,000 persons are required to handle the Federal Government's legal work.

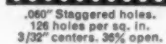
## Perforated Materials for Every Application

Contact H & K for any perforated materials your product may require.



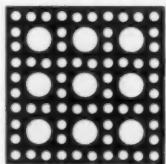
No. 00 Straight Holes  
852 holes per sq. in.  
.025" diam. 30% open.

We have tools for perforating thousands of different patterns.



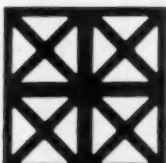
.060" Staggered holes.  
126 holes per sq. in.  
3/32" centers. 30% open.

We will be glad to work with you on your perforating problems.



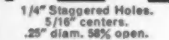
Lincone 47% open

Perforating all metals, Masonite, plywood, paper, cloth and plastic.



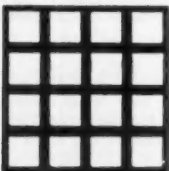
Perflex 40% open

Fill-in and mail coupon to office and warehouse nearest you.



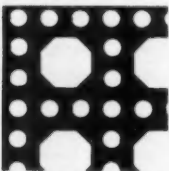
1/4" Staggered Holes.  
3/16" centers.  
.25" diam. 58% open.

See our catalog in Sweet's Product Design File.



Two-tenths square,  
64% open.

Round holes, square holes, slots, ornamental patterns, oblong holes, oval holes.



Cane 41% open.

## The Harrington & King PERFORATING CO.

Chicago Office and Warehouse 5630 Fillmore Street Chicago 44, Ill. New York Office and Warehouse 106 Liberty Street New York, N. Y.

Please send me—

- ☐ GENERAL CATALOG NO. 62
- ☐ STOCK LIST of Perforated Steel Sheets
- ☐ SAMPLES of Perforated Plastics and Paper
- ☐ PRICE INFORMATION (NOTE: Send specifications of perforated materials wanted. If necessary send drawings or sketches.)

NAME \_\_\_\_\_  
TITLE \_\_\_\_\_  
COMPANY \_\_\_\_\_  
STREET \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

it's what's inside  
that counts



THE EFFICIENCY OF

*Luber-finer*

PATENTED PROCESS

**PACK**

HAS NEVER  
BEEN EQUALLED

STANDARD of the INDUSTRY  
SINCE 1936

**DON'T BE MISLED  
BY PRICE ALONE!**

There is no substitute for DIESELPAK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE. The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than any other filtering element. It PAYS to get the BEST!

✓ **Protects engine**

The DIESELPAK is designed to remove not only ABRASIVES but also CONTAMINANTS such as moisture, carbon, acid, etc., from oil, and is engineered to keep the filtering media and the removed contaminants from migrating back into engine.

✓ **Extends periods between drains**

The DIESELPAK collects and holds even the most finely dispersed contaminants without affecting or removing compound additives from the oil. A glance at the dip stick will show that the oil is CLEANER—symbol of better lubrication and longer oil life enjoyed only by Luber-finer users.

✓ **Takes less oil**

The DIESELPAK because of its engineered construction requires 2 to 4 quarts less oil than spongy substitute filter elements being offered for use in the Luber-finer housing. This is an additional saving enjoyed when using the DIESELPAK.

**LUBER-FINER PACKS AVAILABLE:**

**1. REFINING PACK**—Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

**2. DIESELPAK**—First made available in 1941, the DIESELPAK was primarily designed for use with H. D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

Write for complete information to Dept. 44

**LUBER-FINER, Inc.**

2514 S. Grand Ave., Los Angeles 7

## ON OUR WASHINGTON WIRE



House of Representatives has overwhelmingly approved Federal Highway Act of 1956 (HR 10660) and sent it to the Senate. The bill provides for a 13-year program with authorized and contemplated expenditures by the Federal Government of \$37.596 billion. State matching funds of \$14.250 billion would make a total of \$51.846.

Government air pollution studies based on analyses of automotive exhaust gases are to get new financial backing from car manufacturers and the petroleum industry.

Corporate enterprise in the U. S. is operating from the best working capital position it has ever enjoyed. Securities and Exchange Commission figures indicate that, by the end of 1955, corporations had a record net working capital of \$103.6 billion, reflecting an increase of \$7.8 billion during the year.

Gasoline used in farm machinery is freed by a new law from the Federal excise tax of 2¢ per gallon. Tax will remain on gas burned in farmers' cars or in freezing or canning food.

Capital investment in state toll highway systems nearly doubled from 1954 to 1955. It rose from \$445 million to \$826 million, Census Bureau statistics disclose.

Construction machinery manufacturers are to help the Government gather facts on metals consumption by reporting the amounts of steel, copper, and aluminum they used in 1955.

Supplies of copper and nickel, important materials in motor vehicle production, are to become somewhat more plentiful, say Federal officials. Output of copper alone may increase by 30,000 or 35,000 tons annually for the next several years.

Pentagon proposes to withdraw from a sizeable list of commercial-type operations. Largest single category is that for automotive repair activities, consisting of 19 shops in the East, Midwest, and South.

Government controls over metals in the next war will be the strictest in history. Tough new rules are now being written by defense mobilization officials.

Industry experts and Federal officials are to make up a new task force to help titanium producers and fabricators agree on uniform methods and equipment. Business and Defense Services Administration will create the technical group.

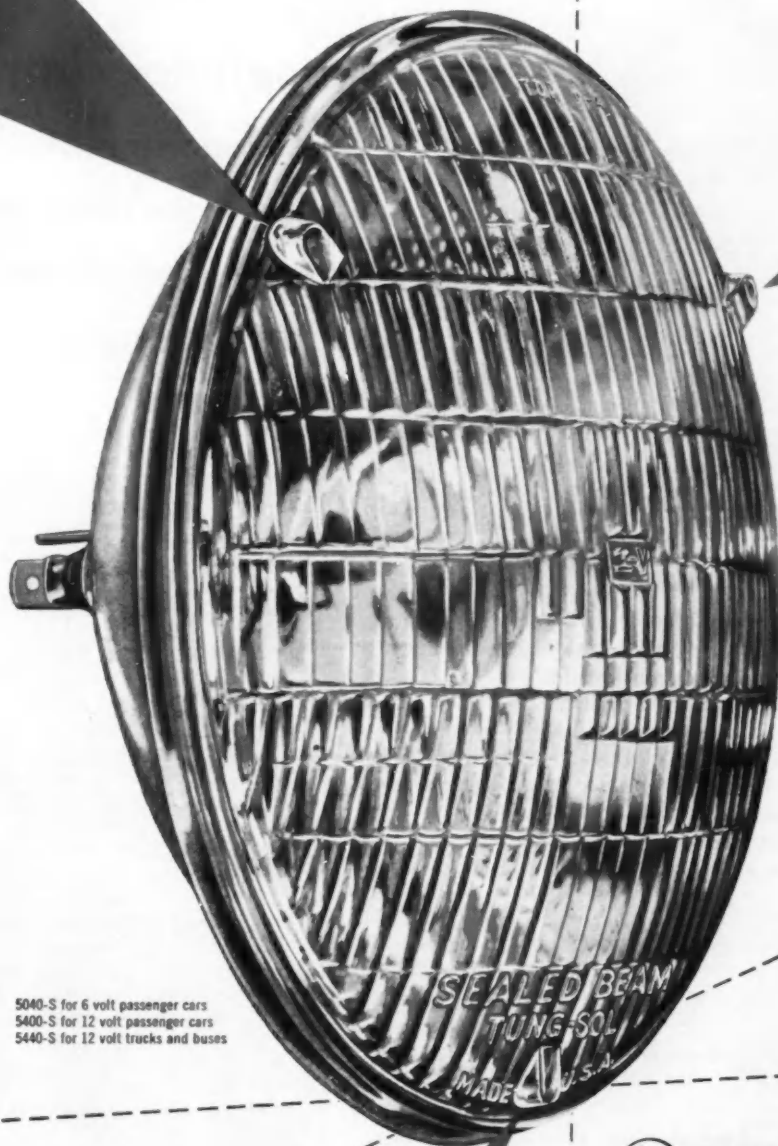
Government has issued new rules governing voluntary refunds paid under renegotiable contracts. They apply to all concerns holding contracts or subcontracts with the Government that come under the jurisdiction of Federal renegotiation regulations, as administered by Renegotiation Board. Copies of the new rules may be obtained by asking Renegotiation Board, Washington 25, D. C., for Staff Bulletin No. 24.

Metalworking items contained in the new list of goods which may be shipped to the Soviet bloc without special Government export licenses include: abrasives; blast furnace slag; hardware, except stainless steel and copper-base alloys; wire products, except stainless steel; construction, excavating, mining, and related machinery; pumps; scales; coal tar products; and a wide range of chemicals and plastics.

Defense Dept. is revising its general procurement policies covering use of negotiated contracts, allowable costs, and allowable profits. New policies, however, may or may not satisfy the biting criticism directed at the military by the Congress.



# VISION-AID HEADLAMPS



5040-S for 6 volt passenger cars  
5400-S for 12 volt passenger cars  
5440-S for 12 volt trucks and buses

*now with*

## E-Z AIM PLATFORMS

*Precision-molded  
platforms for  
accurate beam  
adjustment with  
all approved  
aiming devices*

**ts TUNG-SOL®**

52 YEARS OF LEADERSHIP  
IN AUTOMOTIVE LIGHTING

**TUNG-SOL ELECTRIC INC., NEWARK 4, N. J.**

Sales Offices: Atlanta, Columbus, Culver City, Dallas, Denver, Detroit, Melrose Park (Ill.), Newark, Philadelphia, Seattle, Canada: Montreal.



Miniature  
Lamps



Sealed Beam  
Headlamps



Signal  
Flashers



Radio and  
TV Tubes



Aluminized  
Picture Tubes



Special  
Purpose Tubes



Semiconductors



Color  
Picture Tubes

# NEW V-LOCK TEENUTS®

PATENT APPLIED FOR

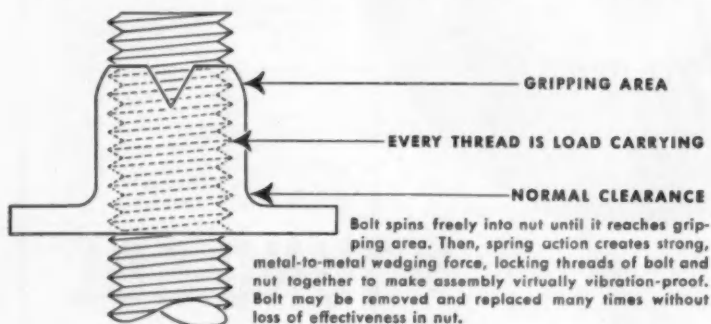


- self-locking
- vibration-proof
- one-piece construction
- proven effectiveness
- highly adaptable
- re-usable

The upper portion of this precision-made Teenut incorporates a V-type notch with the circumference of the barrel compressed inwardly toward the axis to form a permanent set. This makes it a re-usable, prevailing-torque-type, self-locking nut.

It is a one-piece, self-contained unit in which the self-locking device is an integral part of the design. No non-metallic materials or stamped parts are used so that the V-lock Teenut is not affected by heat or oils and has high tensile strength.

As the V-lock Teenut does not rely on base load to obtain its friction grip, it may also be used as a stop nut. (Indentations in base flange are welding bosses).



The V-lock Teenut is but one of thousands of special purpose fasteners designed and manufactured by United-Carr to help speed assembly, cut costs and improve product performance. For further information on the V-lock Teenut or for help with any other fastening problem, consult your nearest United-Carr field representative or write us for his name and address.

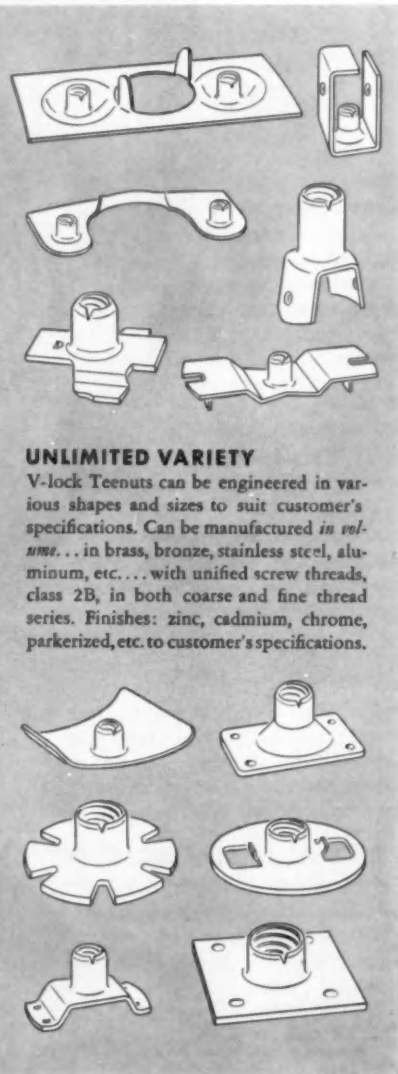
## UNITED-CARR FASTENER CORPORATION

31 Ames Street

MAKERS OF **DOT** FASTENERS

Cambridge 42, Mass.

SEE US AT BOOTH 511, DESIGN ENGINEERING SHOW



### UNLIMITED VARIETY

V-lock Teenuts can be engineered in various shapes and sizes to suit customer's specifications. Can be manufactured in volume... in brass, bronze, stainless steel, aluminum, etc. ... with unified screw threads, class 2B, in both coarse and fine thread series. Finishes: zinc, cadmium, chrome, parkerized, etc. to customer's specifications.

# Q: *How to heat vehicles?*

**Q:** *Chilly day at Thule ( $-50^{\circ}\text{F.}$ ) . . . how to start fire-crash truck within seconds, provide 90,000 Btu/hr. in small space?*

**A:** Janitrol liquid heater (tested to  $-65^{\circ}\text{F.}$ ) keeps engine ready to go, provides cab and cargo heating too!



**Q:** *How to find money to build heated storage buildings for Diesel bus fleet?*

**A:** No need to find it, park the fleet outside—Janitrol liquid heaters keep engines, and bus interiors warm, ready to go at a fraction of cost of new building.

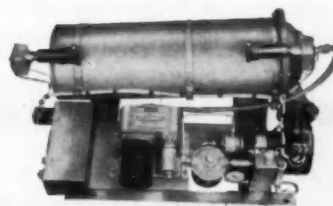


# A

**A:** Call on Janitrol. If there's a need for heat for the job anywhere, chances are Janitrol can supply it, or build it from service-proved components.

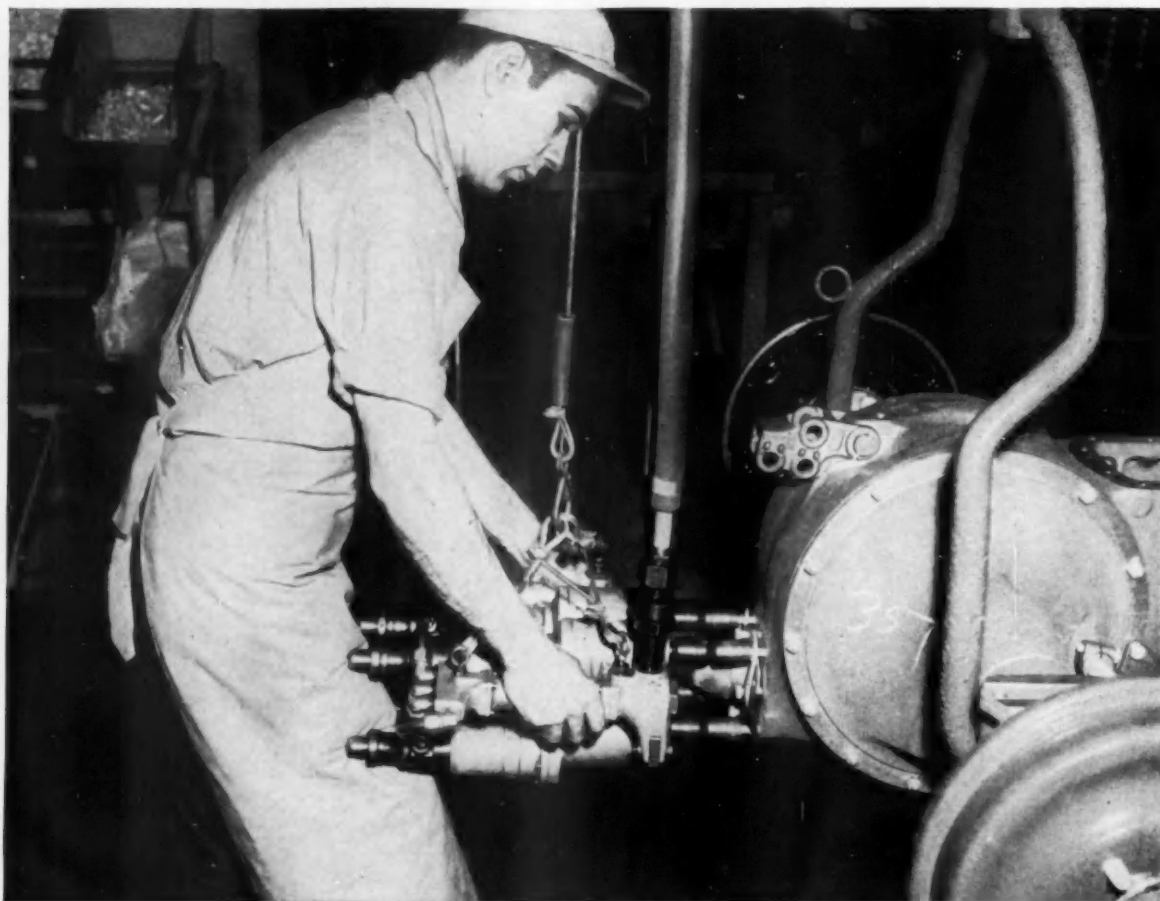
Ever since designing and manufacturing the first successful heaters for aircraft 14 years ago, Janitrol has built thousands of heaters for aircraft and ground vehicles.

Today the name Janitrol stands for leadership in heating equipment and combustion engineering. Your Janitrol representative is always at your service.



**AIRCRAFT-AUTOMOTIVE DIVISION, SURFACE COMBUSTION CORPORATION, COLUMBUS 16, OHIO**  
DISTRICT ENGINEERING OFFICES: NEW YORK, 225 BROADWAY; WASHINGTON, D. C., 4650 EAST-WEST HIGHWAY; KANSAS CITY, 2201 GRAND AVE.; FORT WORTH, 2509 BERRY ST.; HOLLYWOOD, CALIF., 7046 HOLLYWOOD BLVD.; COLUMBUS, OHIO, 400 DUBLIN AVE.

**Gardner-Denver...** Serving the World's Basic Industries



Keller Tool 4-Spindle Air-Powered Nut Setter attaches power take-off to rear axle assembly.

## **Line it up and GO . . . with a Keller Tool Multiple Nut Setter**

No other nut setter gives you all these important features in one tool:

- 1. REGULATED AIR PRESSURE TO EACH SPINDLE** for individual control to close torque tolerances. Eliminates additional torque inspection.
- 2. ALL COMPONENTS SPECIFICALLY DESIGNED** for multiple nut running.

**3. EXTREME FLEXIBILITY** permits motor units of any size in the same tool. Tight bolt clusters at different elevations and angles. Handles placed conveniently.

**4. QUICK CONVERSION** to other tool applications. Standard components make this a simple job. Only the mounting plate and tubing change.

Maybe you have a multiple nut running job? Send us a blueprint.  
Keller Air Tool designers will suggest money-saving assembly tools and methods.

# **GARDNER - DENVER**

**KELLER TOOL division, Grand Haven, Michigan**

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS  
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

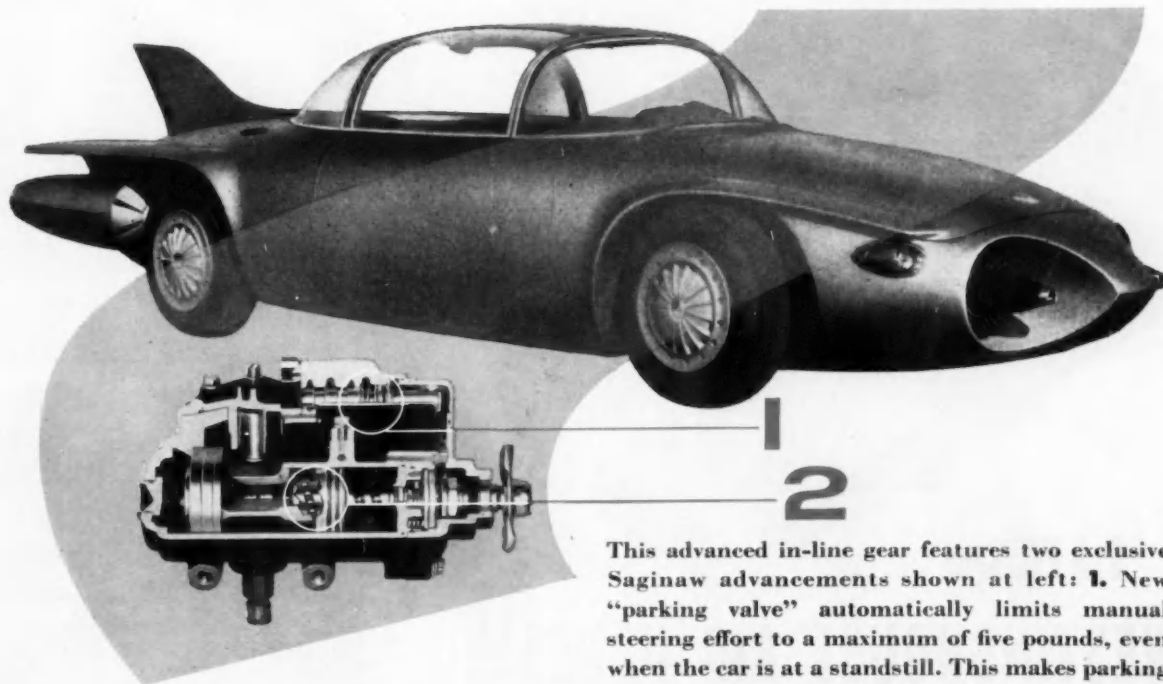




NEW

# SAFETY POWER STEERING SYSTEM

FEATURED IN FIREBIRD II



**Standard production gear with features so advanced they are used without modification in experimental gas turbine car**

One of the very few standard production units with features considered good enough to be used in the revolutionary Firebird II is Saginaw's new Safety Power Steering system, which is standard equipment or optional on all 1956 Cadillacs, Buicks, Oldsmobiles and Pontiacs.

This advanced in-line gear features two exclusive Saginaw advancements shown at left: **1.** New "parking valve" automatically limits manual steering effort to a maximum of five pounds, even when the car is at a standstill. This makes parking almost *twice as easy* as with other types of power steering, yet fully retains Saginaw's famed "feel of the road". **2.** New pre-loaded worm provides "micrometer" control on the highway, by keeping the gear snug on center. It assures extremely precise control on straightaways, with much less tendency to "wander" in gusty crosswinds.

The new unit never needs grease because it is constantly lubricated by the hydraulic fluid itself. It is also far more compact, simpler and lighter than other power steering gears. Here is proof again that Saginaw leads the field in Power Steering, as it has in manual steering for many years!

NEW  
**Safety**  
**POWER STEERING**  
by **Saginaw**

**STEERING GEAR DIVISION OF GENERAL MOTORS, SAGINAW, MICHIGAN**

AUTOMOTIVE INDUSTRIES, May 15, 1956

For HEATING, VENTILATING and AIR CONDITIONING



**NEW...**

## WESTINGHOUSE AIR HANDLING COMBINATION UNITS in 13 basic sizes give you Unlimited Selection...

The most complete line for every job—Westinghouse Air Handling Combination Units handle from 500 to 48,500 CFM.

These versatile units, each with a choice of two coil face areas; in five coil types (see panel at right) and accessories as required, permit you to select from the broadest line in the industry.

**Only Westinghouse Gives You:**

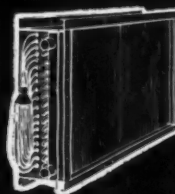
- High Efficiency

- Quiet Operation
- Non-Pulsating Air Flow
- Corrosion-Resistant Construction
- High Capacity—Low Resistance Coils
- Single Equipment Warranty

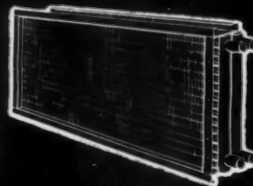
For complete application service, call your Consulting Engineer or your nearest Sturtevant Division Sales Engineer . . . or write Westinghouse Electric Corporation, Sturtevant Division, Department 5E, Hyde Park, Boston 36, Mass.

## WESTINGHOUSE AIR HANDLING

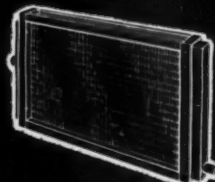
YOU CAN BE SURE... IF IT'S **Westinghouse**



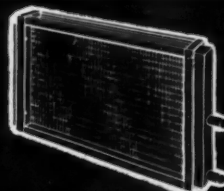
**DIRECT EXPANSION FOR COOLING AND DEHUMIDIFYING** . . . 3-4-5 and 6 rows deep.



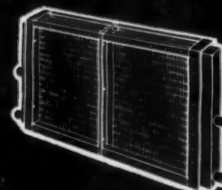
**WATER COILS** . . . for heating, cooling and dehumidifying—2 through 8 rows deep.



**STANDARD STEAM HEATING COILS** . . . for use with modulating damper control—1 and 2 rows deep with 3 fin spacings.



**STEAM DISTRIBUTING TUBE COILS** . . . for use with modulating steam valve control—1 and 2 rows deep with 3 fin spacings.



**DUAL FEED STEAM DISTRIBUTING TUBE COILS** . . . available in fin tube lengths—78 through 120 in.—1 and 2 rows deep with 3 fin spacings. Operates as two coils in single casing—supply and condensate connections at each end—eliminates stratification.



The first comprehensive filtration guide ever edited specifically for designers.

Where are filters used? Why are filters used? How do filters save money? Now for the first time Purolator's new "Filtration Manual for Designers" has all the answers gathered together in one place.

**Some typical section headings**

- space requirements
- filter costs
- selection of type of element
- deciding flow capacity needed
- economics of filtration
- how Micronic® and metal edge filters are made

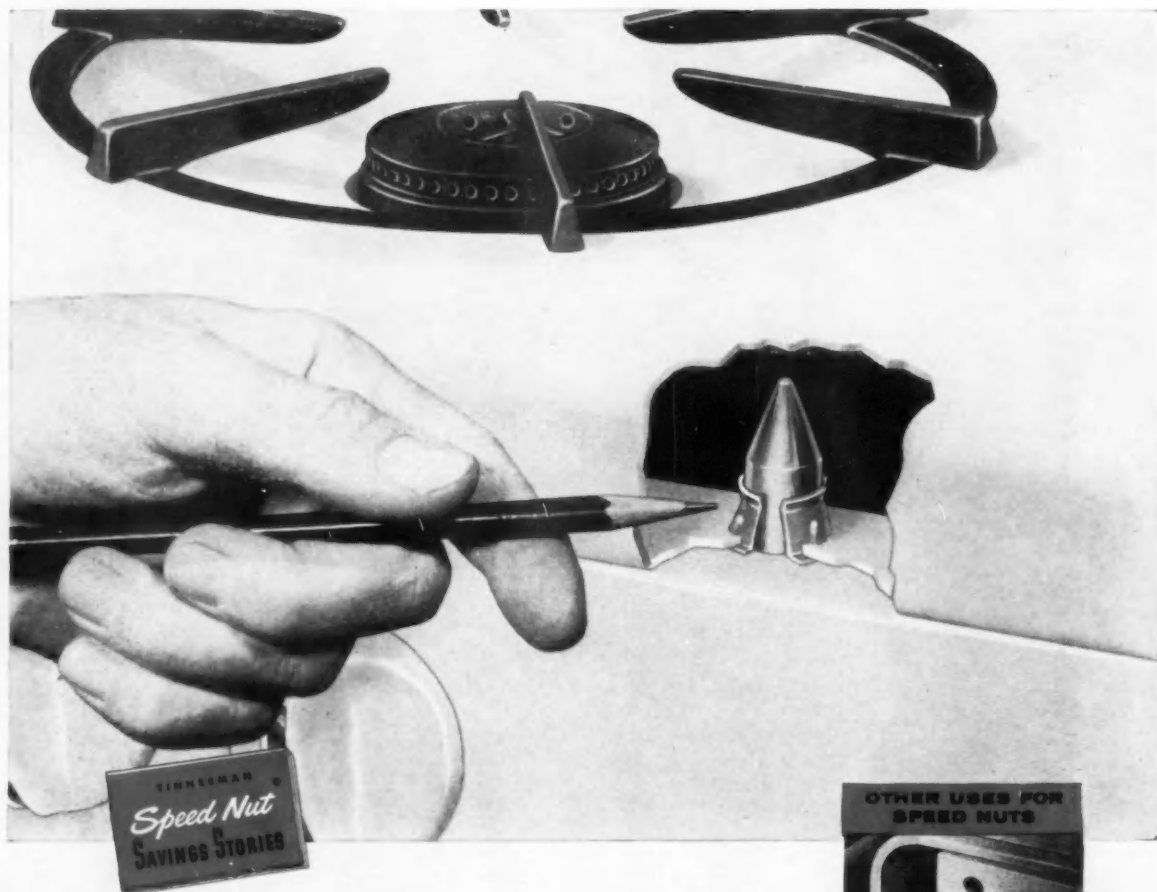
"Filtration Manual for Designers" spells out application considerations in detail including degree of

filtration, flow rate, contamination to be removed, viscosity of fluid, plus a complete glossary of terms that apply to filtration. Printing of this manual is limited so please send in coupon for your copy today.

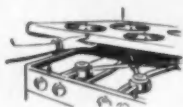
**PUROLATOR PRODUCTS, INC.**  
Dept. DE-516, Rahway, N. J.

Please send my copy of your "Filtration Manual for Designers."  
I'm enclosing 25¢ for postage and handling.

NAME \_\_\_\_\_  
COMPANY \_\_\_\_\_ POSITION \_\_\_\_\_  
STREET \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_



## Blind attachments made at 82% lower cost ...with Tinnerman SPEED CLIPS®!



Automatic Range Company, Brooklyn, cut assembly costs on its Royal Rose Ranges 82% with a Tinnerman tubular-type SPEED CLIP®. It locks the removable range tops securely in place. Automatic Range designers were able to eliminate a costly bracket, a wire form catch and a spot welding operation with this engineered fastener.

One-piece, spring-steel SPEED CLIPS are quickly and easily snapped into punched holes in the range's top. Self-retained, the SPEED CLIP grips the mating stud in the front panel flange with pin-point accuracy under live spring tension for a firm, vibration-proof attachment. Yet the top is readily raised or removed for cleaning or servicing . . . no tools required!

Tinnerman produces more than 8,000 different types and sizes of SPEED NUT brand fasteners. They are designed to help you make faster, easier, more efficient attachments at substantial assembly savings. Consult your Tinnerman representative for complete information on standard or specially engineered SPEED NUTS. Also write for your copy of "SPEED NUT Savings Stories."

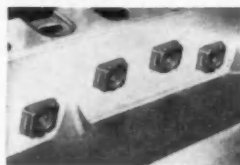
TINNERMAN PRODUCTS, INC. • BOX 6688, DEPT. 12, CLEVELAND 1, OHIO

Canada: Dominion Fasteners, Limited, Hamilton, Ontario. Great Britain: Simmonds Aerocessories, Limited, Troforest, Wales. France: Aerocessaires Simmonds, S. A., 7 rue Henri Barbusse, Levallois (Seine). Germany: Hans Sickinger GmbH "MECANO", Lemgo-i-Lippe.

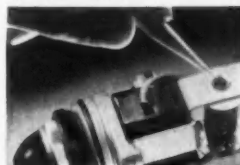
### OTHER USES FOR SPEED NUTS



In a heating-unit assembly, "J" type SPEED NUTS eliminate problems of hole misalignment and paint clogging.



On truck radiators, costly retapping of flash-clogged threads of weld-type fasteners is eliminated by SPEED GRIPS.

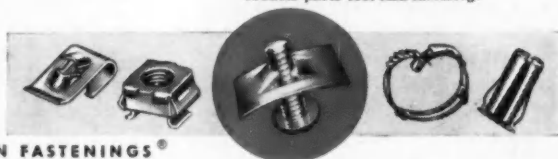


On an indicator light, Tubular SPEED CLIP replaces 4 parts, reduces parts cost and handling.

# TINNERMAN

## Speed Nuts®

FASTEST THING IN FASTENINGS®







## Meet the axle . . . . . that has outlawed broken axle shafts

### *Here is a most impressive fact:*

This planetary driving axle developed by Clark especially for heavy duty off-highway machinery has established a record of performance in which broken axle shafts are practically unknown.

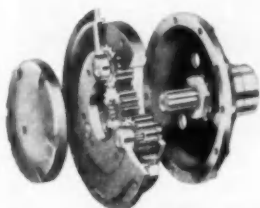
Here truly was a challenging design problem: To develop an axle that would (1) handle the terrific torque demands of punishing construction jobs; and (2) provide sustained highway speeds up to 27 mph.

Both these stiff requirements are fully satisfied by this Clark Planetary Axle. 70% of the torque load is taken off the shafts—transferred to the planetary assembly in the wheel. Shaft wind-up and surge are virtually eliminated—in contrast to axles of conventional type, whose shafts get the total shock of full torque. Power flows more smoothly—no chatter, less “digging” in soft ground. No wonder broken shafts are practically unknown.

Are you seeking ways to improve your own machines? It's high time you got acquainted with this axle that has outlawed broken shafts. A helpful bulletin will be sent on request—use the coupon.



**Primary Reduction** in the center section, by helical bevel pinion and gear.



**Second Reduction** in the drive wheel—a sun gear splined to the axle shaft and three planet gears driving an internal gear in the inner periphery of the wheel, as close as possible to the point where tractive effort is applied. Two types: steering and non-steering.

CLARK EQUIPMENT COMPANY • AXLE DIVISION, Buchanan 2, Michigan

**CLARK**  
EQUIPMENT

Please send illustrated bulletin on the Clark Planetary Axle.

Name \_\_\_\_\_ Position \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



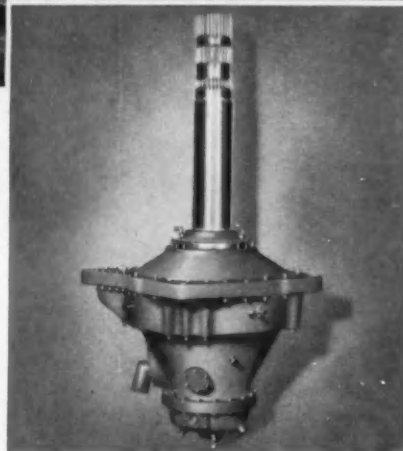
*Expediting development of an inaccessible area with helicopter... in transporting men, machinery, material.*

## World's Largest Turbo Transporter

### Pours Out Its Power Through SPECO Transmissions

This mammoth turbine-powered helicopter of "1001" uses is the Vertol YH-16A. The production version will be able to carry up to 12 tons and can whirl into action without warm-up to achieve an air speed of over 150 mph. Transferring the output of its turbine into a smooth, steady flow of propelling power is the job of the forward and aft transmissions produced by SPECO, the Steel Products Engineering Division of Kelsey-Hayes.

The manufacture and assembly of gears and gear assemblies which insure dependable, maintenance-free performance such as required in the Vertol YH-16A is a Speco specialty, one of 40 years standing in service to the aviation industry.

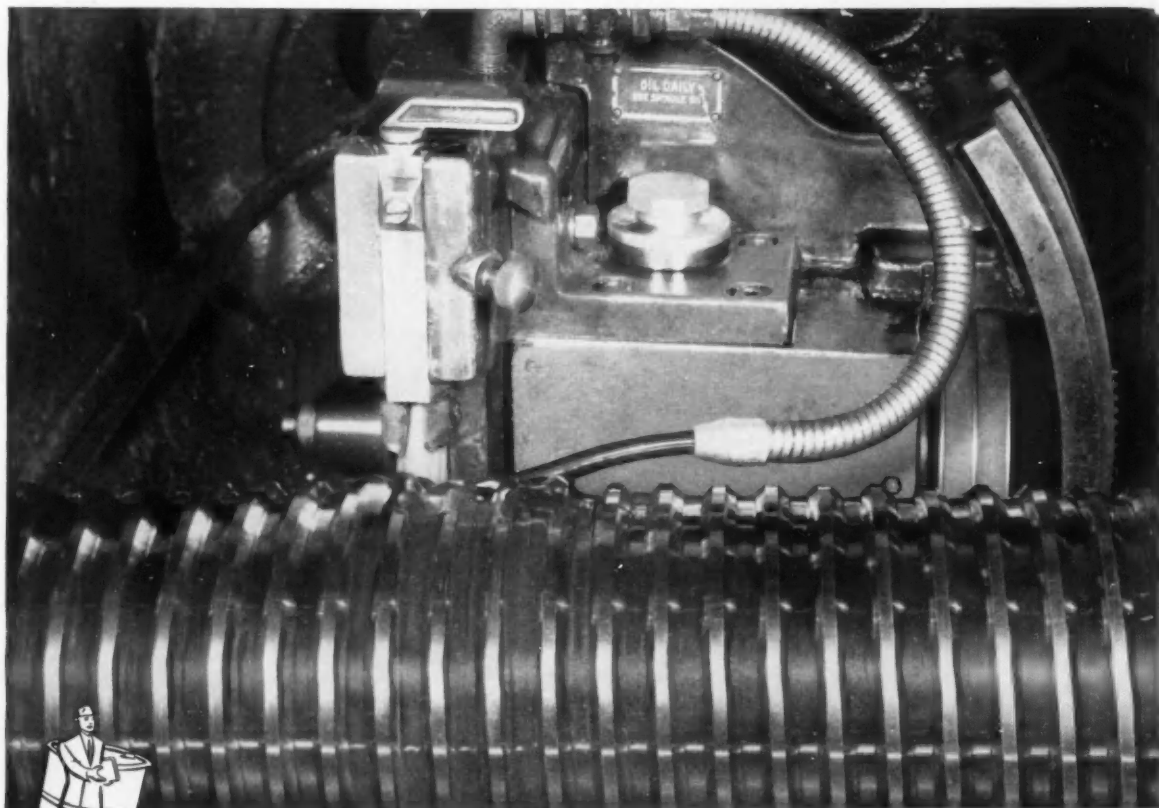


**Rotor transmission from YH-16.** The transmissions, clutch assemblies, synchronizing shafts and drive shaftings are produced by Kelsey-Hayes in accordance with Vertol's design specifications.

# KELSEY-HAYES

**Kelsey-Hayes Wheel Co., Detroit 32, Mich. • Major Supplier to the Automotive, Aviation and Agricultural Industries**

**TEN PLANTS /** Detroit and Jackson, Michigan; McKeesport, Pa.; Los Angeles, Calif.; Windsor, Ontario, Canada • Davenport, Iowa (French & Hecht Farm Implement and Wheel Division) • Springfield, Ohio (SPECO Aviation, Electronics and Machine Tool Division)



**Ask "the Man in the Barrel" to tell you how . . .**  
**A Grinding Oil can make or break**  
**precision grinding jobs!**

If you're using *just a coolant* or any oil that happens to be handy for those precision grinding jobs . . . it's costing you money!

A grinding oil can make or break a precision grinding job such as thread grinding, gear grinding and many types of form grinding. Grinding oils are usually classified as "hard-acting" or "soft-acting" depending on how they affect grinding wheel hardness. Grinding oil characteristics must be closely co-ordinated with wheel characteristics, speeds, feeds, and material machinability and hardness to obtain maximum performance.

When form grinding low hardness materials, where wheel form is important, a "hard-acting" oil helps to maintain proper wheel form by making the wheel act harder. As a result, greater wheel life is obtained and more accurate parts are produced.

When a high hardness material is being ground there is a tendency for the wheel to load-up and glaze. Such a condition is the cause of burnt work surfaces and heat checks, and is often encountered when grinding taps, gauges and other hardened parts. A "soft-acting" grinding oil will make the wheel act

softer, opening up the wheel and exposing new abrasive grains to do the work.

Stuart's complete line of grinding oils have been chemically balanced and scientifically tested to meet the demands of various types of precision grinding operations. "The Man in the Barrel," your trained Stuart Representative, will be happy to assist you in selecting the proper grinding oil for your particular needs. Ask to have him call . . . and ask for a Stuart's Precision Grinding Oil Bulletin, too.

**D. A. STUART OIL COMPANY, LTD.**  
 2733 S. Troy Street, Chicago 23, Illinois

**More than a "Coolant" is Needed**

Plants in: Chicago, Detroit, Cleveland, Hartford, Philadelphia and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.



**Stuart Oils**

*Time Tested Cutting Fluids and Lubricants*

*If the  
question  
is...*

PRODUCTION SPEED?  
MULTIPLE-PIECE ACCURACY?  
SMALL INVESTMENT?

# Lodge & Shipley 10" HI-TURN is the answer!

*The low base price includes electrical equipment, ammeter, direct reading cross feed dial, dial for apron hand-wheel, pan, multiple length stop arrangement for use with either flat or round templates, pump and tubing, etc.*

The Lodge & Shipley 10" HI-TURN Lathe is a completely new concept in lathes. Designed for high production at low cost, it eliminates rarely used features . . . includes many standard features never before found at any cost.

The result is a rugged lathe of high accuracy on single or multiple-piece work. Provides productive capacity at a price substantially below conventional lathes. We can prove more production per lathe dollar . . . more production per operator hour!

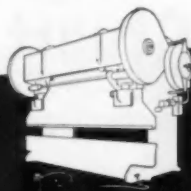
Find out about the Lodge & Shipley 10" HI-TURN. Write today for full, detailed literature, Bulletin 300, The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.

## Proved-for-Production Features:

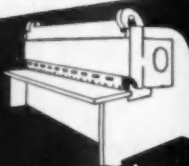
- 9 color-coded speeds up to 3000 RPM and 5 HP
- Totally enclosed 100% anti-friction quick change gear box with rugged all-spur gearing
- Dynamically braked motor in leg
- Template-type length stops
- Flame-hardened replaceable steel bedways
- Hardened and ground cross slide ways
- Direct reading cross feed and top slide dials
- Provision for rear tool block and multiple tools
- Magnetic feed clutch and brake
- And many others



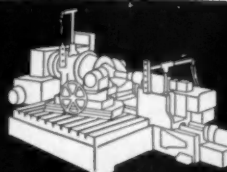
Hydraulic Presses



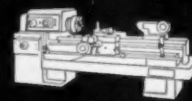
Press Brakes



Squaring Shears



Floturn Machines



Lathes





from  
stylist's drawings  
to finished cabs  
with  
"eye appeal"

## ALLEN TAKES THE JOB ALL THE WAY

A talent for bringing eye-appeal and practicality together has made Allen leader in cabs for industrial trucks, tractors, motor graders, front-end loaders, off-highway trucks and similar equipment.

Allen appreciates what the stylist has strived to achieve, and what you, the customer, want in the finished product. Making engineering drawings from stylists' renderings is an old story with Allen. So, too, is the manufacture of cabs which meet the

demands of work-a-day use and abuse. And, Allen doesn't stop here. Allen follows through with field service and service parts. In steel, in plastics, in other materials Allen experience can help make *your* machines better looking, safer, more practical to operate in every kind of weather.

Allen's complete service can save you engineering man-hours and money. Mail the coupon or telephone WOODWARD 2-8578 for full information.



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BATTLE CREEK, MICH.

WOODWARD 2-8578

America's foremost designers and builders of cabs for industrial trucks and construction machinery—shovels and plows for industrial trucks.



**ALLEN INDUSTRIAL PRODUCTS, INC.**  
LIBERTY STREET, BATTLE CREEK, MICH.

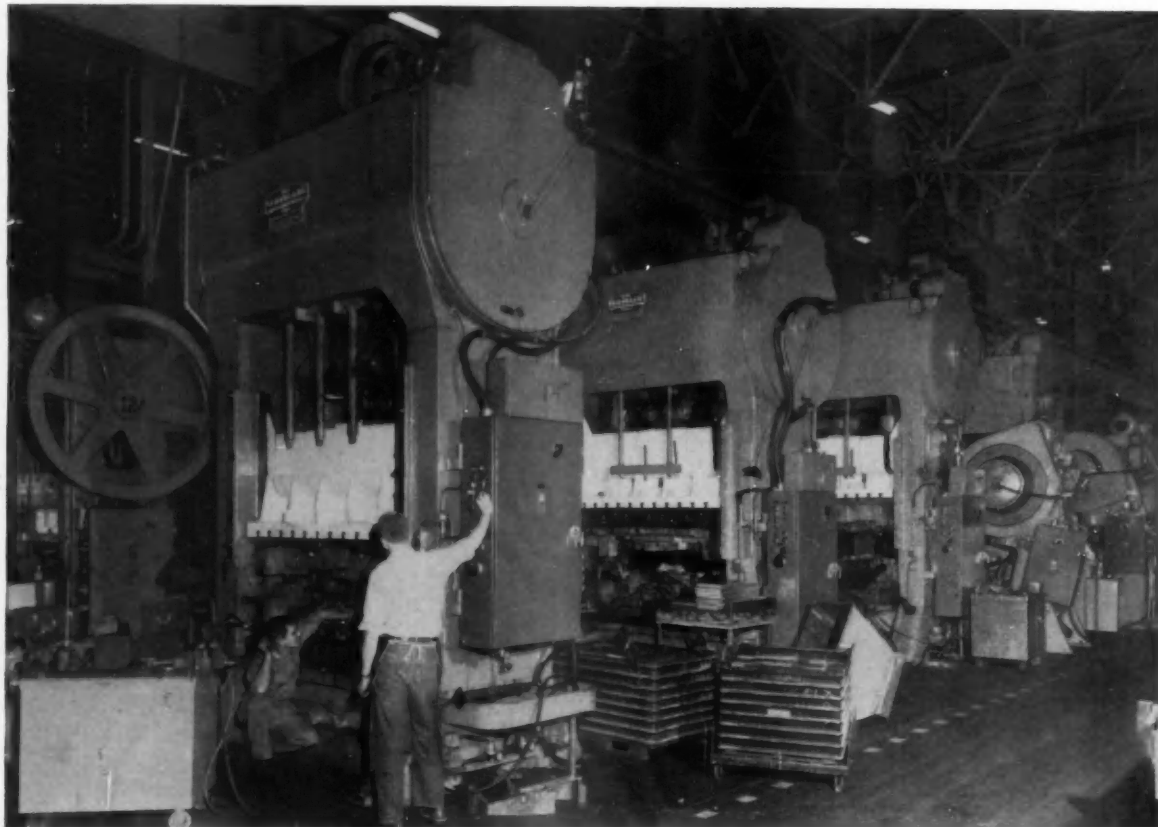
- ☐ Send details on cab design and building service.  
☐ Send representative.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

Specify type, make and model of equipment \_\_\_\_\_



## **Cleveland Drum Type Clutch** speeds die adjustment . . . cuts production costs

These Cleveland Two-Point Presses equipped with patented Cleveland Drum Type Friction Clutch have done just that. You'll find that even the largest Cleveland Press equipped with a Cleveland Clutch is as easy to control as the smallest inclinable.

Press slide can be exactly "inched" for faster die adjustment or can be operated on a single stroke or continuous cycle with instantaneous starting and stopping. Operators have positive control at all times. Increased slide control extends die life . . . reduces stamping rejects.

Designed with a minimum number of moving parts, there's less chance of failure with a Cleveland Clutch. When necessary, adjustments can be made right on the press. Light-weight construction reduces horsepower required for operation. Spring-loaded brake stops slide immediately in event of electric or air supply failure. To prevent die damage, clutch can be set to slip under overload.

Install Cleveland Clutches on your older press equipment regardless of make or model. You'll get increased efficiency for lower production costs. Write or call today.



*Eleven types of Cleveland Presses assure unbiased recommendation.*

**THE  
CLEVELAND**  
PUNCH & SHEAR WORKS CO.

Established 1880

**POWER PRESSES - FABRICATING TOOLS**



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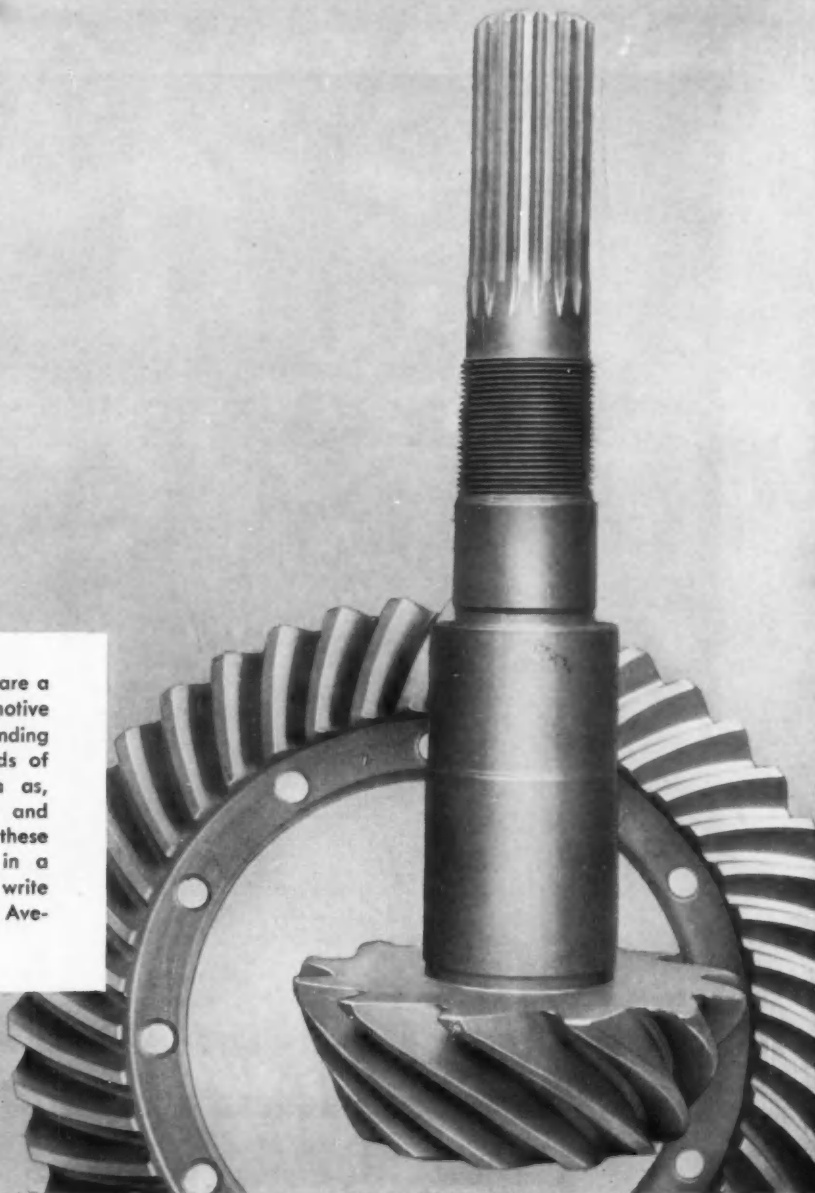
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**CITY FOUNDRY DIVISION • SMALL TOOL DEPARTMENT**



"IT'S BETTER IF IT CONTAINS MOLY"

Moly carburizing steels with 0.5% Mo are a natural for components like this automotive ring-gear and pinion. They have outstanding properties that suit them to the demands of gearing and similar applications, such as, superior case hardness, low distortion and good machinability. Many features of these new carburizing steels are discussed in a recent technical article. For a reprint, write Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y., Dept. 4.



# Molybdenum Carburizing Steels

## MOLYBDENUM OFFERS THE ECONOMICAL KEY TO PERFORMANCE

Over the years, molybdenum carburizing steels have proved their merits in scores of applications and at every level of production.

**Design engineers** know moly steels for their uniform hardenability, toughness and wear resistance.

**Production men** know that moly steels are easy to heat treat, easy to machine.

**Management** knows that moly steels mean economy in fabrication, high performance in a wide range of end products.

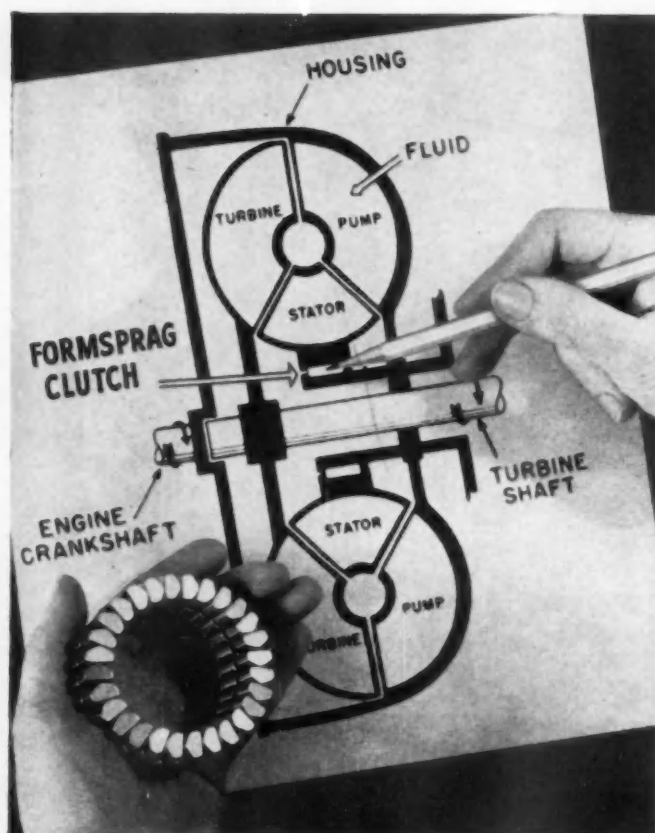
Standard molybdenum carburizing steels are widely available. Higher moly analyses may be ordered in heat lots from a number of leading suppliers.

### CLIMAX MOLYBDENUM

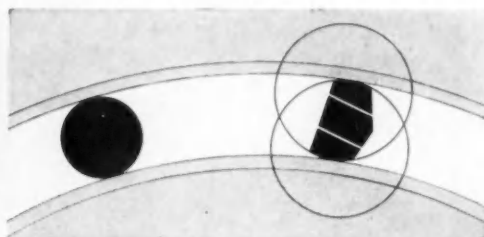


Use the  
Moly Key  
to better  
carburizing  
steels

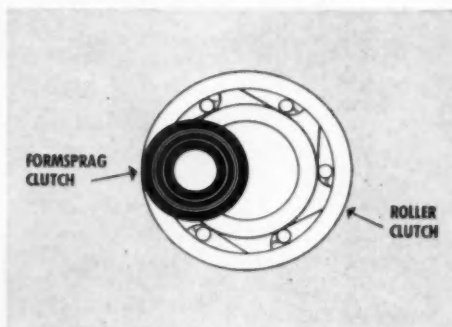
- High case hardness
- Wide choice of hardenability
- Easy to heat treat
- Low distortion
- Good machinability
- Good wear resistance



Formsprag Clutches shown in a typical transmission torque converter. Basic principles insure maximum torque in minimum area.



Forcing a roller into a curved, wedged space is an old, over-running clutch principle. The sprag is, in effect, a "roller" of increased diameter—therefore, of increased torque capacity. By increasing the diameter of the roller, you get considerable increase in load carrying ability.



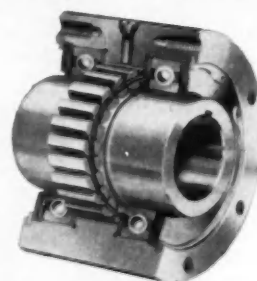
Compare it with other types of clutches—note the size of each of the above types of clutches, yet each delivers approximately the same ultimate capacity. Not only does the Formsprag Clutch deliver more torque capacity for size and weight than any other type of over-running clutch, but you are also assured of longer life and greater accuracy through Formsprag's advanced design principles.

## How Formsprag Over-Running Clutches give maximum torque in less space in modern Transmission Torque Converters

Inherent in all modern transmissions today is the need for more efficient power in a smaller area—whether sleek, low-slung cars or powerful, rugged road building equipment.

Torque converters in transmissions, of course, have this same requirement. That's why more and more manufacturers are relying on the advantages of Formsprag Over-Running Clutches to simplify their designs.

There are numerous over-running, backstopping or indexing applications where Formsprag Clutches are ideal. The Formsprag engineering staff is thoroughly familiar with thousands of clutch applications. Why not contact Formsprag today for further information and/or design assistance?



Shown is a typical Formsprag Over-Running Clutch. Applications in light and heavy vehicles are almost unlimited. New applications are being discovered daily.

**FORMSPRAG**  
*Company*

A10-58

World's Largest Exclusive Manufacturers of Over-Running Clutches

Distributors in Principal Cities  
23583 Hoover Road, Van Dyke, Michigan



# Engineered FOR THE Tough Jobs

## .... CONTINENTAL RED SEAL POWER



The new 4-wheel drive Oshkosh 50-50 ready-mixed concrete carrier is built to haul up to 5 cubic yards legally, with enough water for ready-mixed concrete operations. Its Continental Red Seal B6427 engine is cantilevered forward of the front wheels, distributing the load equally between the two axles, and making the unit conform to maximum load limits in most states . . . Continental F4162 engine driving the 4½ cu. yd. Rex Adjusta-Wate Moto-Mixer is mounted at rear of the machine, making possible the most efficient load distribution over all axles, for carrying maximum payload.

When it comes to tough jobs, the hauling of ready-mixed concrete ranks well toward the top of the list. It takes a real engine merely to move such a monster as this, to say nothing of lugging it over all sorts of terrain in order to spot the load. Continentals have been known for dependability for more than half a century. Their famous in-built stamina is earning them a place in more and more of today's heavy-duty equipment, not only in transportation but in industry and farming as well. Every Continental Red Seal is built for the job in which you find it—and backed by service and parts facilities coast to coast.

**OPPORTUNITIES FOR ENGINEERS**  
Continental Motors and its subsidiaries have numerous openings for engineering personnel interested in challenging careers in gas turbine and reciprocating engine development. For information, address Engineering Personnel Dept., 12800 Kercheval Ave., Detroit 15, Mich.

### *Continental Motors Corporation*

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# LONG



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Long's expansion of facilities and personnel was motivated by the extension of our products to new fields and new applications.

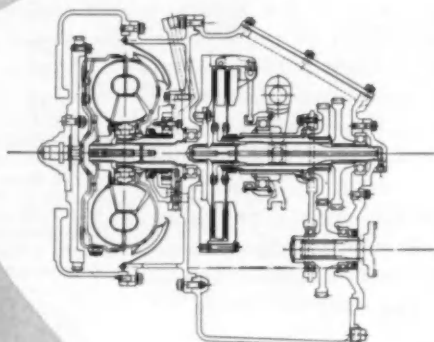
Our emphasis on the development of our manufacturing and engineering services to industry can serve you in the most practical manner—through paring costs and delivery dates.

Long experts stand ready to design and build in volume, products with a savings potential for you.

## LONG MANUFACTURING DIVISION, BORG-WARNER CORPORATION

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Torque Converter with Power Shifting forward and reverse gearing.

### "Power Package"

#### TORQUE CONVERTER COMBINATIONS

Accurately engineered to your own power transfer requirements, B-W torque converter transmission combinations provide extra rugged construction, reduced maintenance costs, greatly improved performance. Now available in package form are any of the Borg-Warner volume production drive line products . . . a wide variety of torque converters • transmissions • industrial and agricultural clutches • power takeoff and speed reducers • and many other "Power Package" combinations.

THE STANDARD OF QUALITY AND PERFORMANCE SINCE 1903

*See what adhesives are doing today!*



PHOTO COURTESY OF MUSKOGON PISTON RING CO.

## "Unitizing" piston rings



Anyone can appreciate the task of inserting a multiple-piece piston ring into place. It takes time . . . and time costs money!

That's why more and more auto makers and repair shops are using "unitized" oil control rings. They're pre-assembled. Spacer and rails are bonded into a one-piece ring through the use of a 3M adhesive.

As a result, these rings are easier to handle, easier to install, saving money for manufacturer and consumer. The adhesive used is

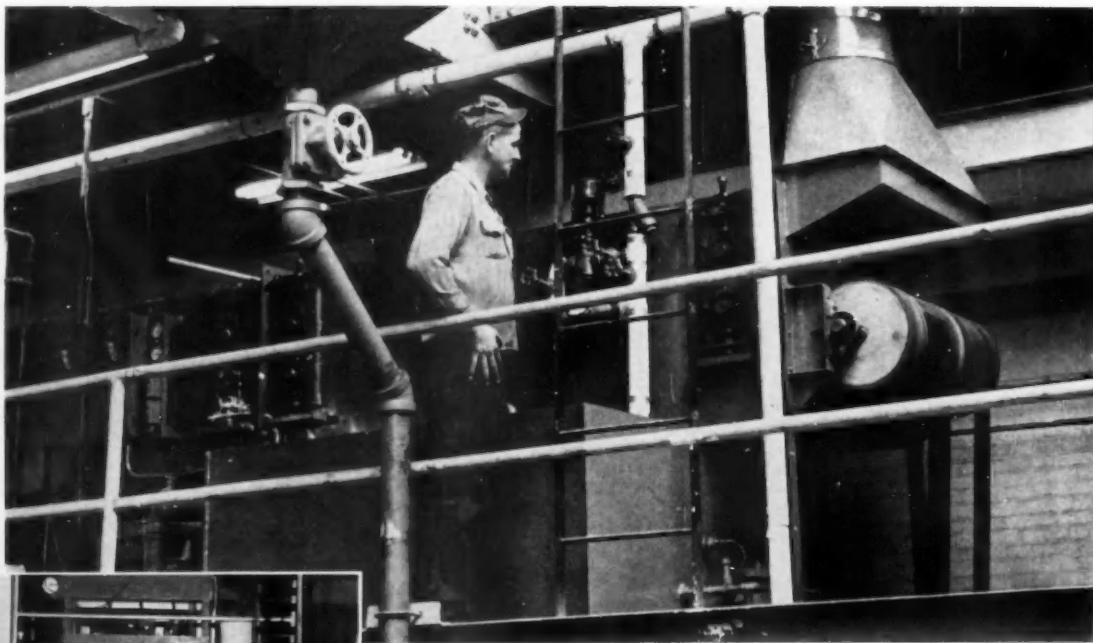
well suited for this application. It dissolves in engine oil, leaving ring elements separate for efficient operation after the first run.

### See what adhesives can do for you . . .

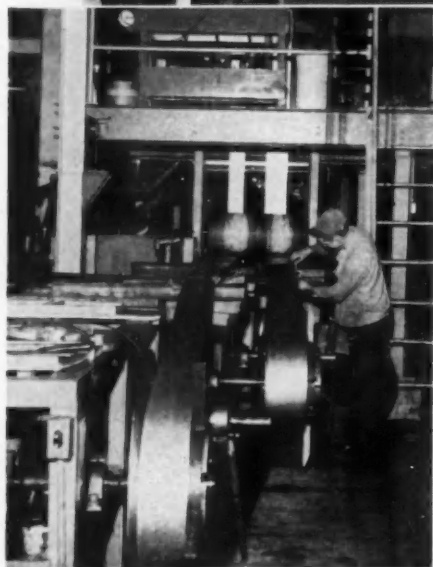
This is an example of how 3M adhesives are cutting costs for industry today. Your 3M Field Engineer would like to tell you of other instances. For details, call him in. Or, for a free factual booklet, write today to 3M, Department 315, 417 Piquette Avenue, Detroit 2, Michigan

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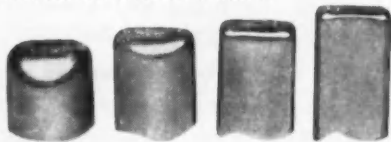
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Photos courtesy Thompson Wire Company



Above (right)—In this continuous installation, strip steel is treated with Bonderite, then with Bonderlube lubricant. Below, treated strip is re-coiled as it comes out of the machine, Bonderite-Bonderlube treated.



Successive steps in forming a small case from Bonderite and Bonderlube treated strip.

For better performance  
in the forming dies . . .

Get steel strip, mill-treated with

## BONDERITE and BONDERLUBE

Here's a service that can mean real savings in your cold forming operations. Buy mill-treated steel, in coils, treated with Bonderite and Bonderlube and ready for the dies.

This specially treated strip, with its Bonderite-Bonderlube coating, is used for many products and components made by cold forming. The combination of Bonderite and Bonderlube provide such effective lubrication that severe deformations are possible without marring surface finish. Tools and dies last longer, production may be greatly increased, production costs are reduced.

Investigate mill-treated steel strip with Bonderite and Bonderlube. Ask your strip supplier about this new development.

\*Bonderite, Bonderlube, Parco, Parco Lubrite, Parker Pre-Namel—Reg. U.S. Pat. Off.

# PARKER RUST PROOF COMPANY

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**BONDERITE**  
corrosion resistant  
paint base

**BONDERITE and BONDERLUBE**  
aids in cold forming  
of metals

**PARCO COMPOUND**  
rust resistant

**PARCO LUBRITE**  
wear resistant for friction  
surfaces

**TROPICAL**  
heavy duty maintenance  
paints since 1883

Since  
1914 —  
leader in  
the field



**Q** • What constitutes a dependable  
• source of metal powder parts?



**A:**

If the source is strong in experience, ability and good judgment—like Moraine Products—it cannot miss being dependable.

Moraine has the experience gained from the production of millions and millions of metal powder parts in an infinite variety of shapes and sizes. Moraine has the engineering, metallurgical and production ability to take a part designed for a specific application and produce it economically, most often in only one press operation. And finally, Moraine, too, has the good judgment to turn down designs submitted for quotation if the potential customer cannot benefit from the metal powder process.

When we accept an assignment to make a part from metal powder, it is only after we are convinced that our material and our process are best suited for the job the part will ultimately be expected to perform for the customer.

Other Moraine Products include: Moraine power brakes—Delco hydraulic brake fluids, brake assemblies, master cylinders, wheel cylinders and parts—Moraine friction materials—porous metal parts—rolled bronze and bi-metal bushings—self-lubricating bearings, Moraine-400 and M-100 automotive engine bearings.

Another General Motors Value

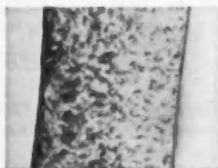


**Moraine Products**

Division of General Motors, Dayton, Ohio



## NATIONAL MICRO-TORC\* LEATHER OIL SEALS



**How Micro-Torc works**—Side of chrome retanned leather lip is coated with dry lubricant and elastomer. Elastomer binds lubricant to leather, prevents seepage through leather, enhances mechanical stability—yet permits leather's natural porosity to remain in body of sealing lip. Lip actually stores oil for dry or emergency running!

For applications where temperatures are within  $-50^{\circ}$  to  $200^{\circ}$  F, maximum shaft speed is 2,000 fpm, and runout is held to about 0.005", new National Micro-Torc oil seals should definitely be investigated.

The Micro-Torc sealing member is perhaps the most interesting advance in leather oil seals in 15 years. In hundreds of thousands of hours of actual application, Micro-Torc seals have consistently shown up to 80% less torque and 10 times the life of other leather seals. Breakaway torque is normally only 20% of conventional leather seals, and Micro-Torc seals have operated up to 100 hours dry at 1,350 rpm without sloughing or squealing. Properly used, Micro-Torc seals provide positive sealing throughout service life.

**Get complete details. Call nearest NMB Engineer, or write for Bulletin.**

Engineering help in your plant and ours. NMB'S Application Engineering Service is fast, expert, convenient. Yours for the asking:

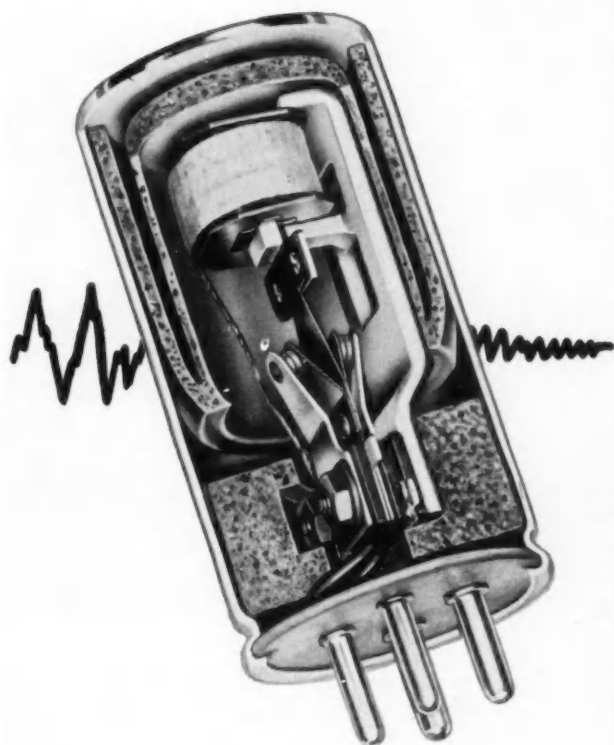
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General Offices: Redwood City



# HUM

## SQUELCHED AT ITS SOURCE

—in Mallory's 25th  
Anniversary Vibrator\*

**R**EVOLUTIONARY design improvements in the latest model Mallory vibrator reduce mechanical hum to the lowest level ever attained in a commercial vibrator.

A look inside the vibrator will show you some of the new ideas that have gone into this outstanding product. Most important is a bell-shaped liner which holds the mechanism from the coil end, effectively isolating the vibrations of the reed element from the case and mounting plug. Combined with an improved design for the cup at the plug end, this liner keeps mechanical "shake" from being transmitted to the chassis regardless of the vibrator's mounting position.

*Parts distributors in all major cities stock Mallory standard components for your convenience*

**Serving Industry with These Products:**

Electromechanical—Resistors • Switches • Television Tuners • Vibrators  
Electrochemical—Capacitors • Rectifiers • Mercury Batteries  
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

Even the lead wires have been re-designed to minimize transmitted noise.

The result is that this improved vibrator actually produces less mechanical hum than the electrical hum coming from the speaker of most auto radio sets.

Equally important to the designer, this premium performance is available *without* premium cost. Price is identical with previous Mallory models.

Plan to take advantage of this new standard of quietness in vibrator operation, in the new equipment you are designing or in circuits you now have in production. Our Technical Bulletin gives full electrical details . . . write to Mallory for your copy today.

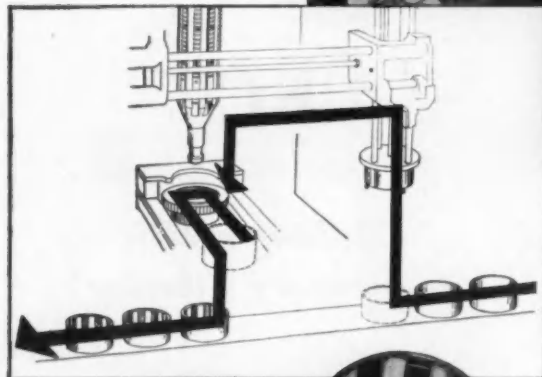
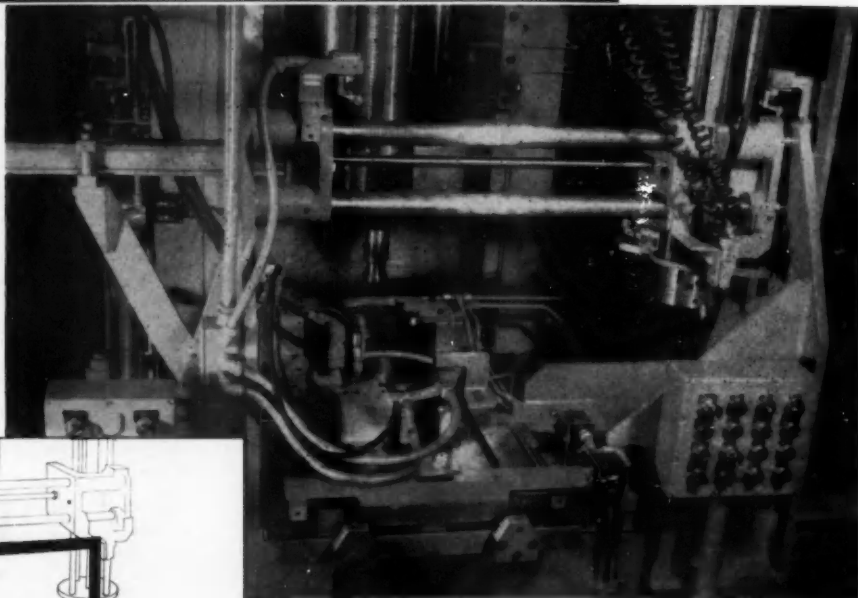
\* Patent Pending

*Expect more . . . Get more from*



more about **AUTOMATION** by *American* ...

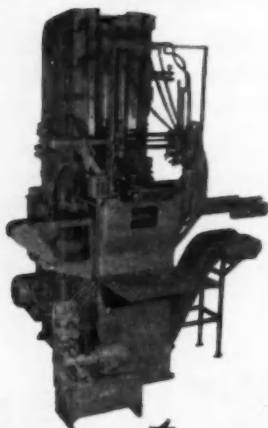
*Brake Drums*  
**SPLINE  
BROACHED**  
*with  
Automatic  
Transfer  
from and to  
Conveyor*



BEFORE

AFTER

American 30 ton—60" stroke pull down broaching machine with full follow-up broach retriever, continuous belt conveyor and automatic chip conveyor.



American engineering solved this automation problem with a hydraulically operated loading mechanism, with an internal chucking device, that picks up the brake drums from a conveyor and inserts them in a collet-type work-holding fixture. The fixture automatically clamps the part and moves it into broaching position. The broach is then pulled down through, broaching 10 splines in the cast iron part. As the fixture slides back to loading position, the part is automatically ejected to the same conveyor line from which it was picked up.

Economical tooling is another feature of the machine. As shown in the simplified cross section at right, an arbor mounts ten sectional surface broach assemblies, which can be easily removed for sharpening and replacement.



American approaches each broaching problem as part of the complete production cycle. Methods of parts handling can frequently be suggested that will give you efficient and stable production. Write or 'phone today — American will be glad to work with you.

ASK FOR CATALOG 450. It's a complete broaching manual.



**American** BROACH & MACHINE CO.  
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

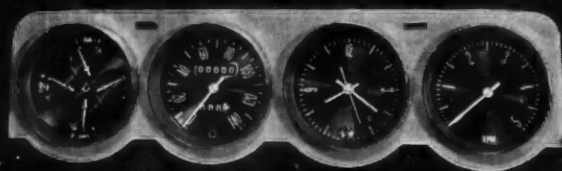






KING-SEELEY

Automotive Instrumentation



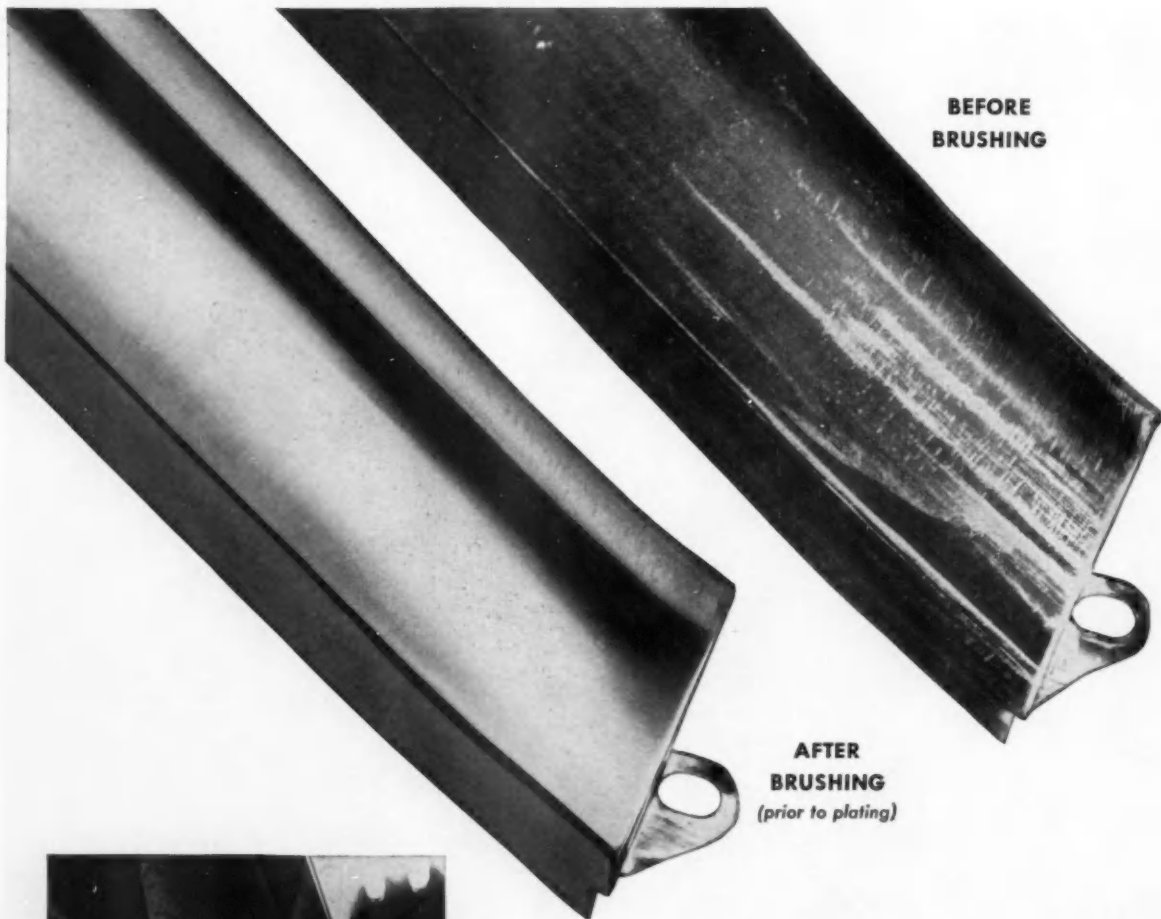
Capably Engineered  
Distinctively Styled  
Quality Controlled



KING-SEELEY CORPORATION

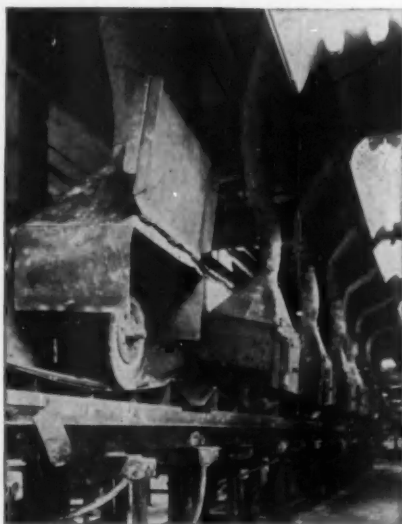
ANN ARBOR, MICHIGAN

7471



**BEFORE  
BRUSHING**

**AFTER  
BRUSHING**  
(prior to plating)



*An important manufacturer of trim uses a continuous 7-head-line of Osborn Fascut® Brushes to finish trim prior to plating at the rate of 1,000 feet per hour.*

## **Keeping in top trim**

**M**AKING a metal product, you undoubtedly use the smooth, mirror-lustre of chrome trim to add eye appeal—and buy appeal—to your product.

And you can further enhance the top-quality appearance of your trim parts—and your product—using Osborn power brushing to produce a perfect, unmarred finish prior to plating.

An **Osborn Brushing Analysis** of your other finishing operations may point up additional ways power brushing can help improve quality. Write *The Osborn Manufacturing Company, Dept. E-41, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

# Osborn Brushes



**BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES  
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES**

# "One Lipe DP Clutch went 112,000 miles without teardown . . . two more are past 125,000 and still going strong."

— says CHRIS CASCIA, Maintenance Superintendent  
Boss Linco Truck Lines, Buffalo, N. Y.



"In September, 1953, Boss Linco Lines received delivery of three White Tractors equipped with Lipe 14" Direct Pressure Clutches. We assigned them company numbers 467, 468 and 469.

"The Lipe clutch in #468 was removed after 112,000 miles because the driven disc had become covered with grease, through no fault of the clutch itself.

"You can be sure we're well satisfied with the mileage we received from this clutch. Except for the grease, it would no doubt still be on the road along with the Lipe clutches in Tractors #467 and #469, which have now gone over 125,000 miles with no down-time for clutch service.

"As you can see, this will make a very happy difference in the maintenance record of all three vehicles."

- If you would like to build clutch mileage like the above into your vehicles, write us today for complete details on the Lipe DP Clutch . . . now available in five sizes for engines developing from 300 to 1300 ft-lb of torque.

Manufacturers of Automotive Clutches & Machine Tools



**Lipe-ROLLWAY**  
CORPORATION  
SYRACUSE 1, N. Y.

# **GUNITE** STEEL WHEELS FOR TRUCKS AND TRAILERS

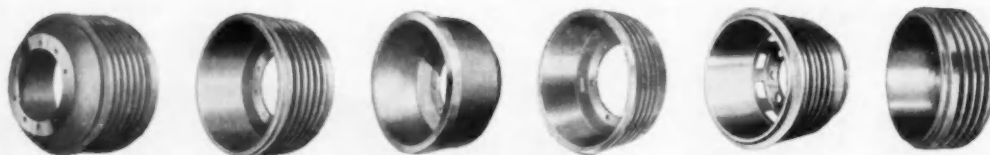


**FOR STANDARD OR  
TUBELESS TIRES**

## **Lightweight...**

Economy . . . Strength . . . Gunite Wheels and tubeless tires form the lightest combination at the lowest price. Specify Gunite Wheels on your new equipment.

## **Gunite Brake Drums for Trucks, Trailers and Busses**



**GUNITE FOUNDRIES CORPORATION • ROCKFORD, ILLINOIS**

*Established in 1854*



# **FEDERAL WELDING PRESS . . .**

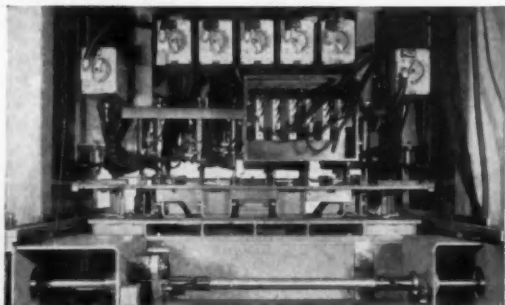
## **a complete seat frame with every press stroke!**

Frames for automobile seat backs and cushions are being resistance welded on Federal Welding Presses at the Great Lakes Spring Division of Rockwell Spring and Axle Co.

Only Federal can offer single company responsibility in supplying both the mechanical welding press and the welder tooling based on their long experience in both press (Warco) and resistance welder (Federal) manufacture.

There are many manufacturing operations existing today where a mechanical welding press would pay dividends. If you have one of them, why not contact the one company best suited to provide the answer? That's Federal — First in Resistance Welding. Welding Press brochure on request.

A variety of welding capsules can be used with these presses. For a changeover in product, simply change the tooling.



Close-up view of welding capsule.



There's no comparison between the old single weld method and this "automated" production line made possible through the Federal Welding Press.

SEE US IN BOOTH 73 AT THE WELDING SHOW

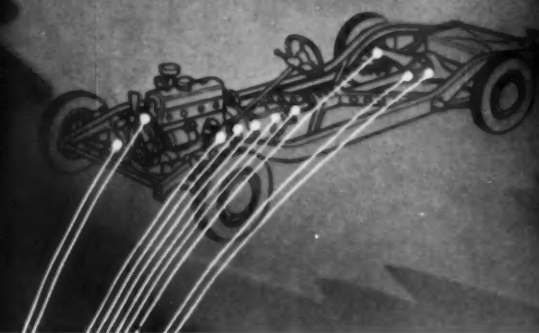
**The Federal Machine and Welder Company**  
WARREN, OHIO

**Federal**  
WELDERS

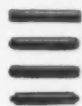
**Warco**  
PRESSES

9967

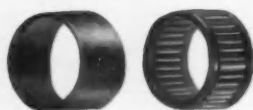
*Oldest in age  
Still in  
the lead*



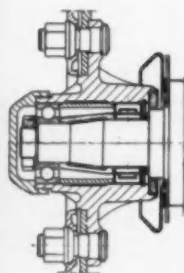
loose needles



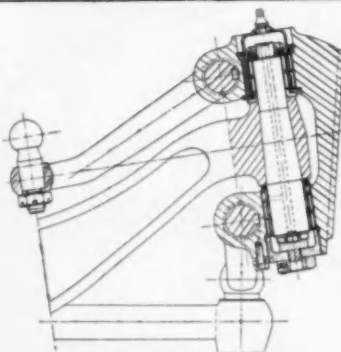
needle cartridges



complete bearings



WHEEL HUB



KING PIN (FRONT AXLE)



CONNECTING ROD



**NADELLA**  
NEEDLE BEARINGS

133 à 137 BOUL. NATIONAL - RUEIL-MALMAISON (S.-&-O.) FRANCE



**SLASH COATING COSTS—  
INCREASE PRODUCTION  
WITH THE NEW**

**MURRAY  
WAY  
ROLLER  
COATER**

- ⚡ Coats one or both sides of work.
- ⚡ Ruggedly built for high production.
- ⚡ Unusually compact design.
- ⚡ New type construction permits fast, easy access to rolls.
- ⚡ Rolls may be removed without disturbing drive.
- ⚡ Upper and lower rolls have separate drives.
- ⚡ Bearings and drive mechanism are effectively shielded from coating fluid.
- ⚡ Easily accessible Vernier roll adjustments.

*You can buff, polish, grind, coat or filter BETTER with Murray-Way*



**MURRAY-WAY CORPORATION**

P. O. BOX 180, MAPLE ROAD EAST • BIRMINGHAM, MICH.

*Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.*



Published in the interest of the Soft Drink Canners Association and the canning industry.

# No headaches in these drinks!

Eliminate the hazard of broken bottles in your plant by providing your employees the safety and convenience of canned soft drinks.

Call your soft drink supplier and learn the many advantages of dispensing drinks the modern way—in cans.



Above are illustrated two of the modern cans for soft drinks, now available for in-plant use.



## THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yaloy Steel

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS



"We wanted the best air brake equipment available..."

Our decision was **Wagner Air Brakes**

says: C. H. Rose, Fleet Maintenance Superintendent  
East Texas Motor Freight Lines, Dallas, Texas



**EAST TEXAS MOTOR FREIGHT LINES**  
GENERAL OFFICES - DALLAS, TEXAS  
440 NORTH WASHINGTON STREET

Wagner Electric Corporation  
6400 Plymouth Avenue  
St. Louis 14, Missouri  
Attention: General Sales Manager

Dear Sir:

Approximately three years ago our company realized the ever-increasing need of having equally as good, if not better, brakes on the small two-ton city tractor power equipment as we normally have on the regular line haul, over-the-road equipment. This meant that it would be necessary for these units to be equipped with air over hydraulic equipment. Knowing that the cost of equipping 120 small tractors, which are used in the city for moving heavily loaded trailers through traffic, was going to entail a large expenditure, we quite naturally wanted to select the best air brake equipment available. Our decision then, and still is, Wagner brake equipment.

The longevity and dependability of Wagner brake air kits are attested to by the fact that during the year of 1954 we traded in 51 of the older city tractors on new units and due to the excellent condition of the air kits on the old tractors, we had the dealers transfer them to the new tractors.

During the past few months we have added additional new tractors to our city fleets and we requested that the delivering dealers equip these units with Wagner. Some of the tractors were equipped in our own shops and, of course, wanted the best brakes. A large group of trucks to be standard and have the best brakes possible, they too had new Wagner air kits installed on them.

Approximately 40% of our over-the-road line haul tractors are equipped with Wagner compressors, etc., and we find they, like our city tractors, are operating very satisfactorily, safe and economically.

Yours very truly,

EAST TEXAS MOTOR FREIGHT

*C. H. Rose*

C. H. Rose  
Fleet Maintenance Superintendent

The experience of East Texas Motor Freight Lines with Wagner Air Brakes is not unique. It is similar in many ways to the experiences of hundreds of fleet operators all over the country. It is concrete evidence that when you equip the units you manufacture with Wagner Air Brakes, you'll be providing the very best braking system available.

Wagner Rotary Air Compressors—9 or 12 CFM—feature rotary motion, uniform torque load, oil separation and air cooling before discharge, and easy infrequent maintenance. Fast air recovery assures an adequate supply of air pressure at all times—an important safety factor.

Wagner Relay and Emergency Valves assure maximum emergency protection and eliminate the need for moving large volumes of air through long air lines. Wagner Brake Application Valves provide smooth, easy stopping.

Learn the complete story on Wagner "straight-air" or "air-over-hydraulic" systems; send for your free copy of Wagner Bulletin KU-201 for full details and data.

Nothing beats the  
controlled safety  
protection of complete  
Wagner Air Brakes

K96-38



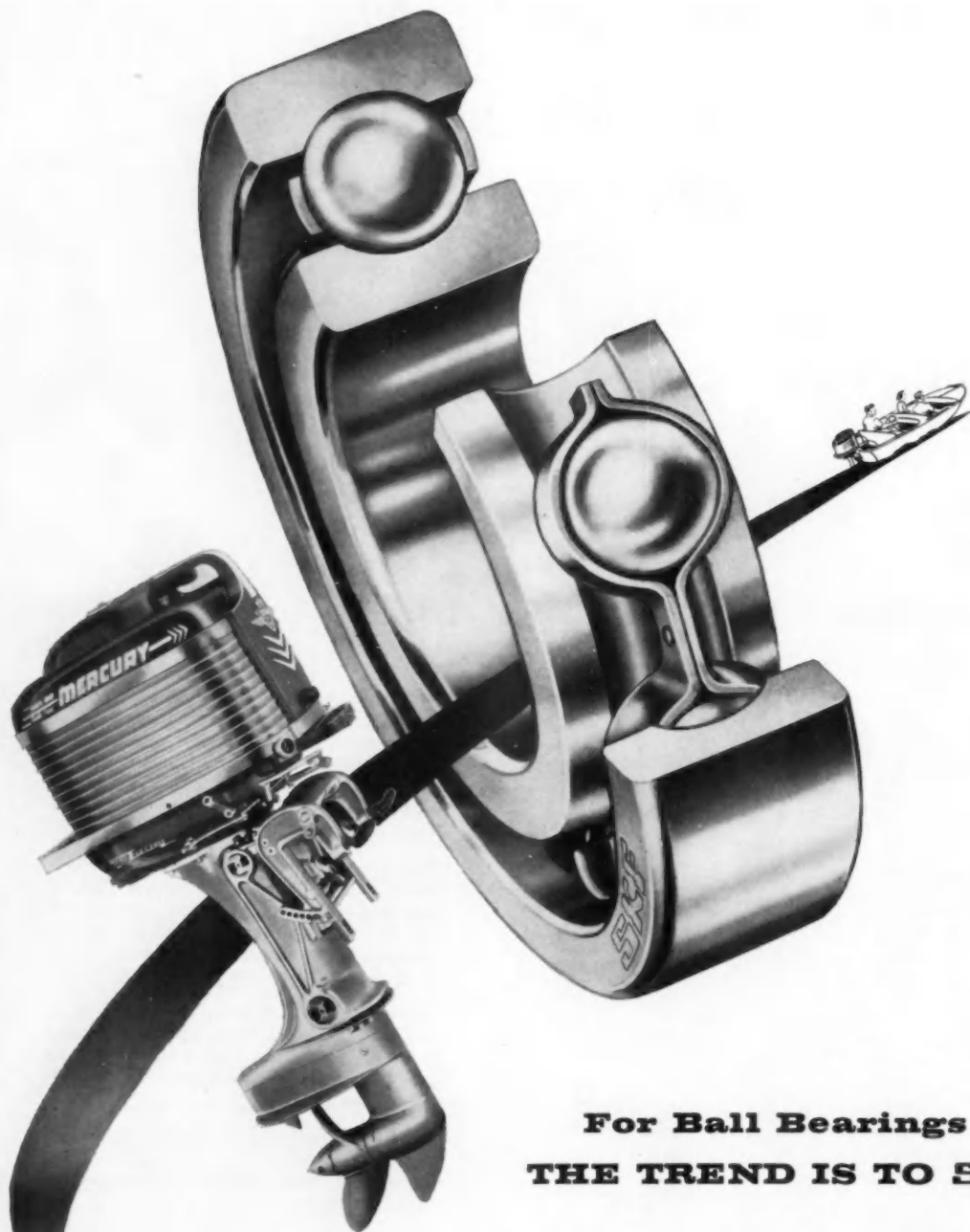
## Wagner Electric Corporation

6363 PLYMOUTH AVENUE • ST. LOUIS 14, MO., U. S. A.

(Branches in Principal Cities in U. S. and in Canada)

LOCKHEED HYDRAULIC BRAKE PARTS and FLUID... NoRol... CoMoX BRAKE LINING... AIR  
BRAKES... TACHOGRAPHS... ELECTRIC MOTORS... TRANSFORMERS... INDUSTRIAL BRAKES





## For Ball Bearings THE TREND IS TO SKF®





Sleek, slim, powerful, quiet... *Mercury Outboards* are the ruler of speed and spray — "Master of the Waterways." Kiekhaefer Corporation, who makes them, was first to feature extensive use of anti-friction bearings in outboards. And Kiekhaefer is another concern that purchases single row, deep groove ball bearings from SKF.

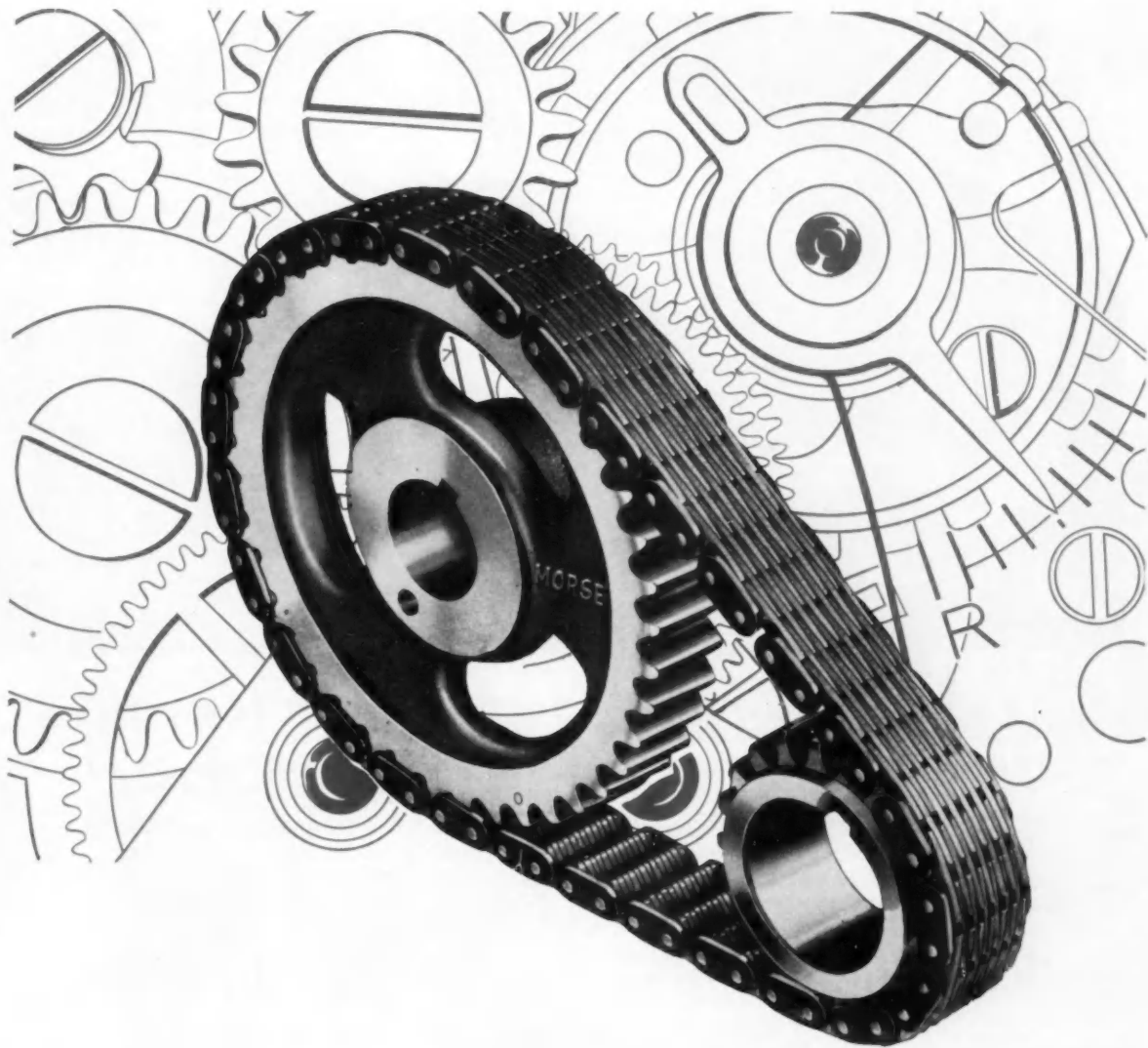
It's a trend... brought about because those whose business is to buy bearings recognize the improvements SKF has achieved in ball bearings — improvements in quiet running, improvements in sealing, improvements in bearing life. Maybe you too should switch to SKF Ball Bearings.

**SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.**

# SKF

**has them all**

Ball Bearings  Cylindrical Roller Bearings   
Spherical Roller Bearings  *Tyson* Tapered Roller Bearings 



## Morse Automotive Timing Chain —built with fine-watch precision

Precision manufacture is your guarantee that Morse Timing Chain—like a fine watch—will give years of dependable, trouble-free service.

Years ago, periodic replacement of timing chains was expected by every auto owner. Today, Morse Timing Chains, specified on 18 out of the 22 automobiles made in America, are expected to last for the life of the automobile.

Life expectancy of timing chains has increased, thanks to Morse's rigid quality controls, auto-

matic precision assembly machines, and advanced inspection equipment.

Check first with Morse on timing chain problems. Find out, too, how well other Morse products can answer your needs in power transmission design and application.

Morse Chain Company,  
A Borg-Warner Industry—  
Ithaca, N.Y.—Detroit, Mich.

# MORSE



\*trademark

**POWER TRANSMISSION  
PRODUCTS**

*Engineered  
Stampings*



## Put this stamping team to work for you

This battery of 195-ton Open Back Inclinable presses is only part of Ackermann-Wheeling's stamping team. Other presses range from 10 to 1,500 tons.

This complete stamping team, including facilities for deep drawing, shearing, spot and arc

welding, brazing, pressing, degreasing and painting, stands ready to solve *your* problem.

Find out now how efficiently and economically *your* product can be mass-produced, assembled and shipped, all from one dependable source. Write, wire or call for full details.

## ACKERMANN MANUFACTURING COMPANY

WHEELING, WEST VIRGINIA

STEEL STAMPING DOES IT BETTER....



ACKERMANN-WHEELING DOES IT BEST!

### Cut your handling costs with Ackermann **BAND-BOX** Steel Shipping Container

PATENT APPLIED FOR

It's the ideal solution to in-plant and inter-plant shipping and storing. Rugged, all-steel construction, yet light weight to save on shipping costs. 15 nested boxes occupy cubic area of 1 assembled box. Nestable parts assemble in seconds. Self-palletizing. Engineered to specific requirements. Call, write or wire for full details on the Ackermann Band-Box.





# NOW---V-R Toolholders to Replace Nearly Every Standard Brazed Tool

Standard Carbide Tipped  
Braze Tool

Comparable Standard Toolholder  
with Carbide Throw-Away Insert

AR-AL



TAPR-TAPL



Straight Turning

BR-BL



TBPR-TBPL



15° Lead Angle Turning

E



TDTR-TDTL



30° Lead Angle Turning

D



TETR-TETL

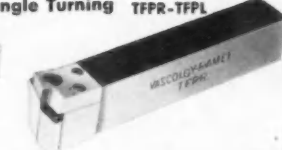


45° Lead Angle Turning

FR-FL



TFPR-TFPL



Straight Facing

FBR



SFPR-SFPL

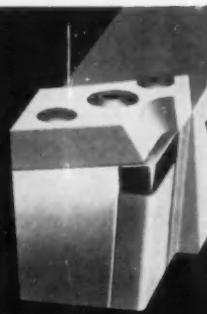


15° Lead Angle Facing

**...You Can Save 10% to 200% on  
90% of Your Machining Operations**

## New 6° Positive Rake Toolholders

offer big savings when machining materials requiring positive rake tools, such as aluminum, soft brass, copper, bronze, stainless steel and alloyed steels. Styles for straight or 15° lead angle turning and facing as well as plunge turning are available.



**No Grinding** when you use V-R toolholders and throw-away inserts!

**Less Downtime** because you do not have to reposition the toolholder when you change or index inserts!

**Less Carbide Inventory** because you get six or eight cutting edges per insert at pennies per edge with negative rake toolholders!

**Lower Carbide Cost** because you eliminate carbide waste. You can consume up to 90% of a long insert with a V-R toolholder, nearly twice as much as with any other!

**Faster Tool Changes** because one main screw controls clamping of the insert—nothing to fall out or require readjustment!

**Long-Life Chipbreakers.** V-R chipbreaker plates are made of a special cast alloy (not steel), chosen for its exceptional wear and shock resistance characteristics.

### ASK FOR NEW TOOLHOLDER CATALOG

24 pages of data on V-R negative and positive rake toolholders and V-R carbide inserts—triangular, square and round throw-away and 1½" lengths. Call your local V-R Representative or Distributor, or write Vascoloy-Ramet today.



MANUFACTURERS OF:

CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS



# Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

820 Market Street • Waukegan, Illinois

TH-577

# ROCKFORD

## FIRST

Using a new type friction material of recent development, ROCKFORD was the **FIRST** to engineer these new materials into MORLIFE Clutches and Clutch Plates. They reduce clutch size and engaging pressure, operate longer without adjustment or plate replacement — and avoid down-time caused by burned or warped plates in heavy duty tractors, trucks, tanks, cranes, power units, shovels, bulldozers, earth movers and other heavy duty machines.

## MORLIFE\*

## CLUTCHES and CLUTCH PLATES



\*TRADE MARK



"MORLIFE clutch has gone 851 hours without slipping or adjustment."



"MORLIFE clutches last 950 hours longer, without adjustment."



"MORLIFE clutch needs adjustment once a month, instead of daily."



"MORLIFE requires lighter handle pull and one tenth the adjustments."



"MORLIFE clutch going strong after 1695 hours, working in sand."



"MORLIFE pulls harder and lasts six to ten times longer."

**400% MORE LIFE**

**100% MORE TORQUE**

**50% MORE HEAT RESISTANCE**

Before you approve specifications for your next models, it will pay you to investigate how MORLIFE Clutches will add to the service life of your product and reduce the number of stops for adjustments and repairs. It also will pay you to recheck specifications for your present models. For information covering operating characteristics, write Department E.

**ROCKFORD Clutch Division BORG-WARNER**

315 Catherine Street, Rockford, Illinois, U.S.A.

# CLUTCHES

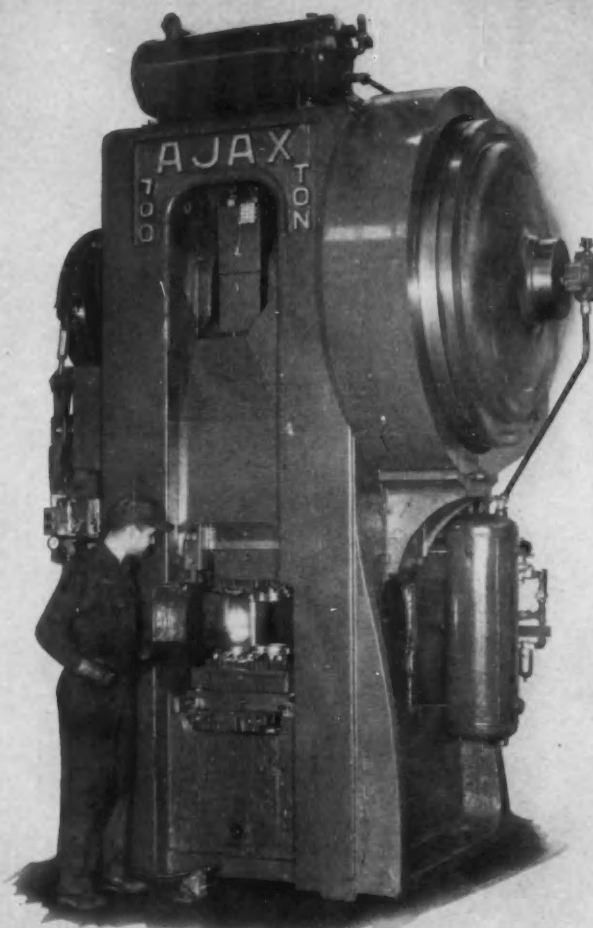
# Forging Gear Blanks to Close Tolerances ... on AJAX *High Speed* Forging Presses

Pictured at the right is a 700 ton Ajax Forging Press in operation forging gear blanks at high speeds in one heat.

The progressive forging operations necessary for forming this blank are shown below.

These and other multi-stage forgings are forged economically to close tolerances with a minimum of flash in Ajax Presses at high rates of production.

For your forging needs Ajax designs and builds presses from 300 tons to 8000 tons capacity.



700 ton Ajax Forging Press in operation.



Write for Bulletin 75 C

THE  
**Ajax**

MANUFACTURING  
COMPANY

CLEVELAND 17, OHIO

110 S. DEARBORN ST., CHICAGO, ILL.

W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.



# NEW

# YALE

## WORKSAVER

**packs  
plenty  
of power  
in only 24"**

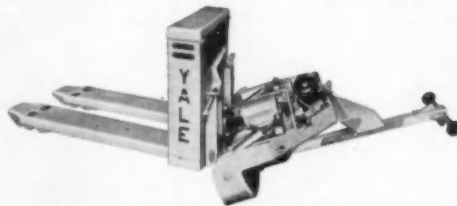
### Only New Yale Worksavers Give You These 4 Big Advantages:

- **High maneuverability**—New Yale *Worksaver*, equipped with a shorter battery compartment, is only 24" longer than the load, leaving more room to maneuver in narrow aisles, other tight areas.
  - **More power**—The short battery compartment accommodates a high-capacity (6-cell, 13-plate) battery to give you adequate power for an 8 hour operation without recharging. For handling operations with extra-heavy power requirements, specify the same Yale *Worksaver* with a 6-cell, 25-plate battery.
  - **Maximum load stability**—Twin vertical lifting cylinders provide load rigidity. Wide-spread, dual-type wheels in each fork assure better load distribution...make turning easy and safe.
  - **Greater underclearance**—Compression tubes, used for lifting, are mounted high in the forks...provide never less than 5" pallet fork underclearance in raised position. Front-end underclearance always remains 3" whether the forks are in raised or lowered position, making ramp-work easy with the new Yale *Worksaver*.
- In addition, new Yale *Worksavers* include many time-tested features—such as automatic time-delay between speeds for smooth acceleration, dual-acting braking sys-

tem for controlled braking action, ball-bearing steering and push-button lifting for greater ease of operation. With new Yale *Worksavers* on the job, you are assured of smoother, faster and safer handling at less cost. Available in 4,000 and 6,000 lb. capacities with either short or long battery compartment. For full facts, write The Yale & Towne Mfg. Co., Philadelphia 15, Pa., Dept. 75.

#### EXCLUSIVE YALE "BREAKAWAY" FEATURE SIMPLIFIES MAINTENANCE.

By simply removing two pins the entire front compartment swings open. Every mechanical and hydraulic unit becomes accessible for quick and easy maintenance.



# YALE \*

\*REG. U. S. PAT. OFF.

## INDUSTRIAL LIFT TRUCKS AND HOISTS

Gas, Electric, Diesel & LP-Gas Industrial Trucks • Worksavers • Warehouse • Hand Trucks • Hand and Electric Hoists





## Boyertown bodies of Mayari R offer "more strength, per pound, per dollar"

**B**oyertown Auto Body Works, of Boyertown, Pa., is a long-time builder of vehicular bodies, and its line of walk-in delivery units is among the largest. One of the secrets of Boyertown's success rests in the belief that there is always a "better way to build a better body."

In that atmosphere, Boyertown's selection of Mayari R high-strength, low-alloy steel was a natural. Because Mayari R's yield point is 50 pct greater than that of carbon steel, Boyertown engineers used it for side panels and key structural members to turn out a rugged design, while cutting overall body weight by 25 to 40 pct.

This, in turn, gave the sales people a highly promotable product which offers "more strength, per pound, per dollar." In the tough stop-and-go service to which walk-ins are subjected, this kind of talk is making good sense to more and more buyers.

Boyertown customers also appreciate Mayari R's resistance to atmospheric corrosion, which is 5 to 6 times that of plain carbon steel. And when it comes to handling in the shop, Mayari R is just about as easy to weld, form, flame-cut and machine as plain carbon steel.

**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**  
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



You'll find a comprehensive picture of Mayari R, and the potential it holds for you, in the pages of Catalog 353. You can get a copy through any Bethlehem district office.



## Mayari R...High-Strength, Corrosion-Resisting Steel.

backed by a 50-year  
record for dependability...

★ ★ ★ ★

# STEWART-WARNER

## INSTRUMENTS AND GAUGES

including complete drive equipment—  
designed, engineered and manufactured  
to your specifications

... all from one manufacturing source!

For half a century, Stewart-Warner has made quality instruments and gauges for automotive, industrial, marine and agricultural applications.

Many leading manufacturers capitalize on this unmatched experience and know-how by specifying Stewart-Warner equipment *exclusively*.

The complete Stewart-Warner line offers you a wide choice of gauges, speedometers, tachometers, and tachourmeters. Entire panels can be custom-made to your own specification. Everything you need for a complete installation—including flexible shafts, gears, and adapters—are available. Let Stewart-Warner supply *all* your instrument needs—from one dependable manufacturing source.

For further information, write:

# STEWART-WARNER

Dept. M-56, Original Equipment Sales  
1826 Diversey Parkway, Chicago 14, Illinois



Speedometers



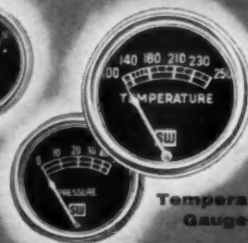
Tachometers



Tachourmeters

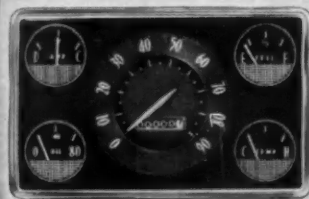


Ammeters



Temperature  
Gauges

Pressure Gauges

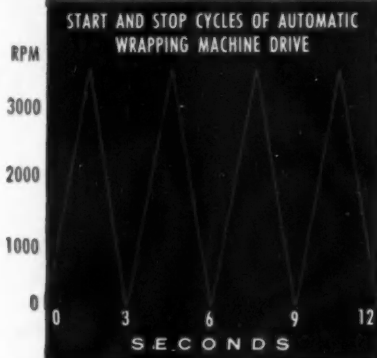


Instrument Panels

Complete  
Drive Equipment  
Custom-Made  
to Your  
Requirements



## 20 ROLLS OF "SARAN WRAP" EVERY MINUTE



The Dow Chemical Company's production of "Saran Wrap" has leaped from 130,000 rolls to 4,000,000 rolls a month since 1951. This up-swing is due to a new plant, a new flow system, and additional equipment including new machinery equipped with Reliance V\*S Drives.

One of the most dramatic applications of V\*S Drives is on the final wrapping machines shown here. The drives must be able to start, accelerate to 3500 rpm., and stop more than 20 times a minute.

The most important feature, though, is not the frequent starts and stops, but the delicately controlled acceleration of the drives. "Saran Wrap" is only 1/6th as thick as a human hair, and sharp or jerky starts will cause a break in the sheet and halt production. Reliance Drives do the job day in and day out without a single break due to uncontrolled acceleration.



Whether you handle a thin film of plastic or steel billets, on a complete production line or a single machine, Reliance can give you better quality, more production, and lower costs through Variable Speed Drives.

D-1508

Write for bulletin D-2311.

# RELIANCE ELECTRIC AND ENGINEERING CO.

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Canadian Division: Welland, Ontario

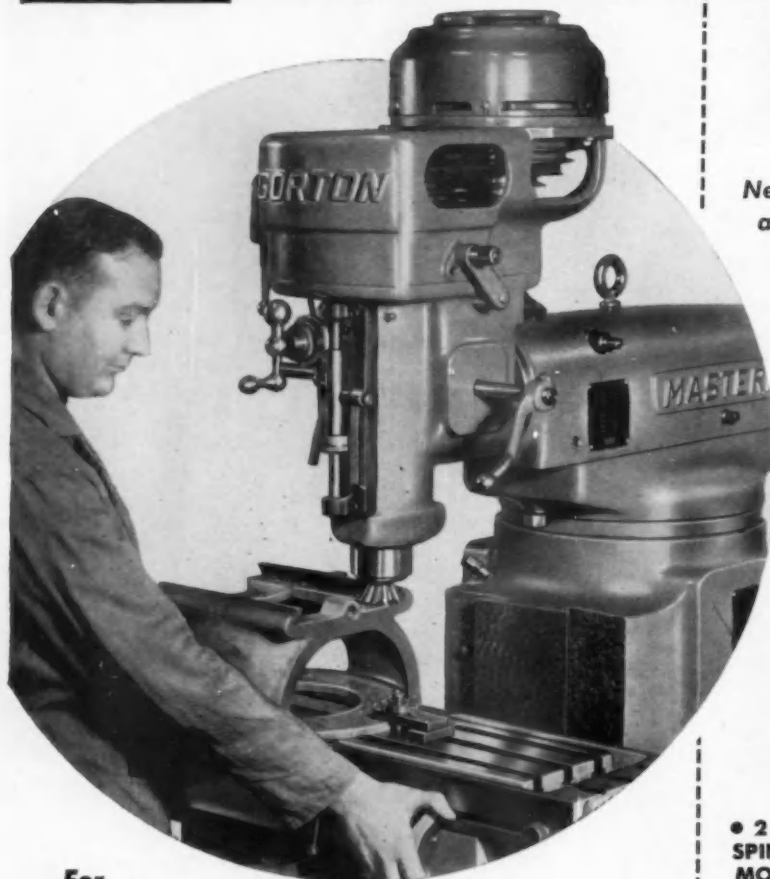
# **NEW Gorton Mastermil**

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(WITH ELECTRICS)

*Never before a machine like this  
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- PRECISION SPINDLE; 10 SPEEDS, 80-5600 R.P.M. STANDARD
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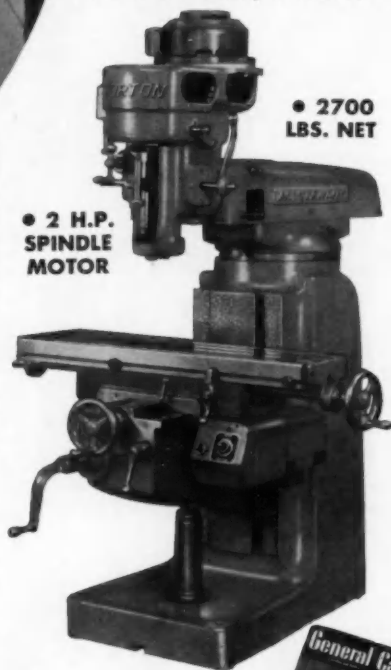
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Infinitely variable spindle feed from ¼ inch to 8 inches per minute.

Infinitely variable table feed (longitudinal) in 4 ranges: from ½ inch to 60 inches per minute.

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• 2700  
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Tracer-Controlled Pantographs, Duplicators — standard and special... Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

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AUTOMOTIVE INDUSTRIES, May 15, 1956



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**PARTS** a day !



**SPLIT-SECOND CLEANING**  
of hidden recesses & blind holes  
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**ULTRASONICS !**

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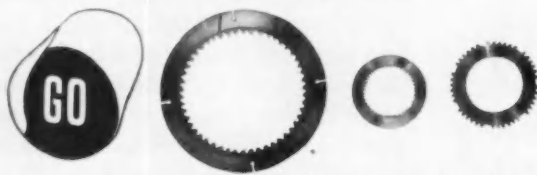


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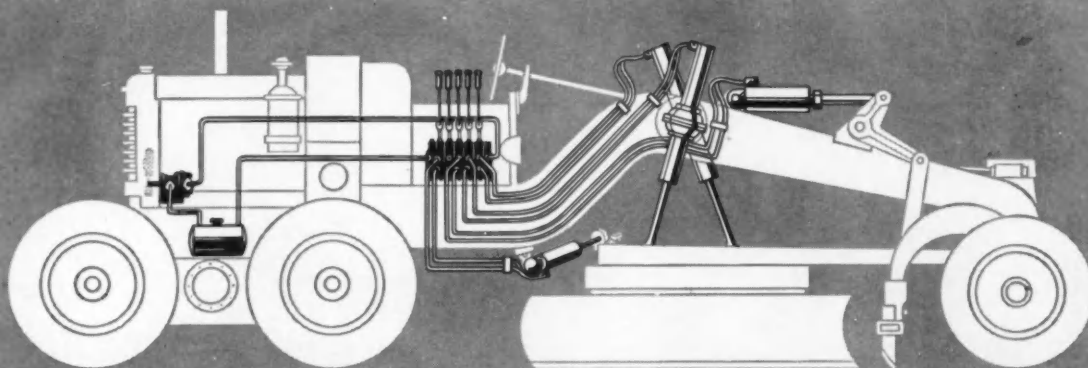
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- 0.12% maximum carbon content for high ductility—permits easy hand bending and flaring
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- Clean and smooth inside and outside surfaces minimize pressure drop
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This motor grader is one of the many types of mechanized equipment that use Superior SAE Hydraulic Low Carbon Steel Tubing.

Superior SAE Hydraulic Low Carbon Steel Tubing is made from a carefully controlled non-aging type of steel which will not harden in storage or use. Aging and precipitation hardening are changes in properties that some steels undergo at atmospheric or moderately elevated temperatures after cooling or cold working. These take place even where steel is stored at room temperature, though at a slower rate.

Superior SAE Tubing, whether in storage or operation,

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*molded*  
*auto parts*

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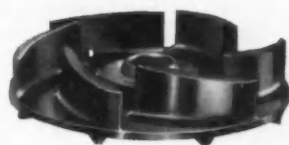
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**..radio antenna mast base** This part had to have good surface appearance, high impact strength, high dielectric strength, and at the same time be weather resistant. A black phenolic material with an attractive high gloss finish was recommended.



**..dashboard light lens** Originally this part was designed as a clear lens. Later, when the specifications were changed to call for a translucent lens, the customer suggested that either the mold, or the clear parts, be sandblasted . . . either process would have increased costs. Richardson suggested, instead, a special light-transmitting polystyrene. Result: 15% reduction in lens cost.

# RICHARDSON PLASTICS

MOLDED AND LAMINATED

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**covering the issues from July 1 to December 15, 1955, inclusive**

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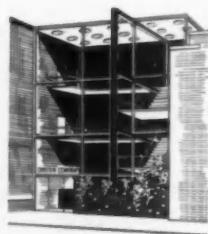
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**MAIN OFFICE AND MANUFACTURING PLANTS  
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Whatever our business, trade or profession, that, we may be certain, is what we'll talk more about than anything else. Talking shop is irresistible. It's a good thing, too. It's an indication of our interest in what concerns us most . . . of our desire to be well informed.

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**molding of rubber provides**

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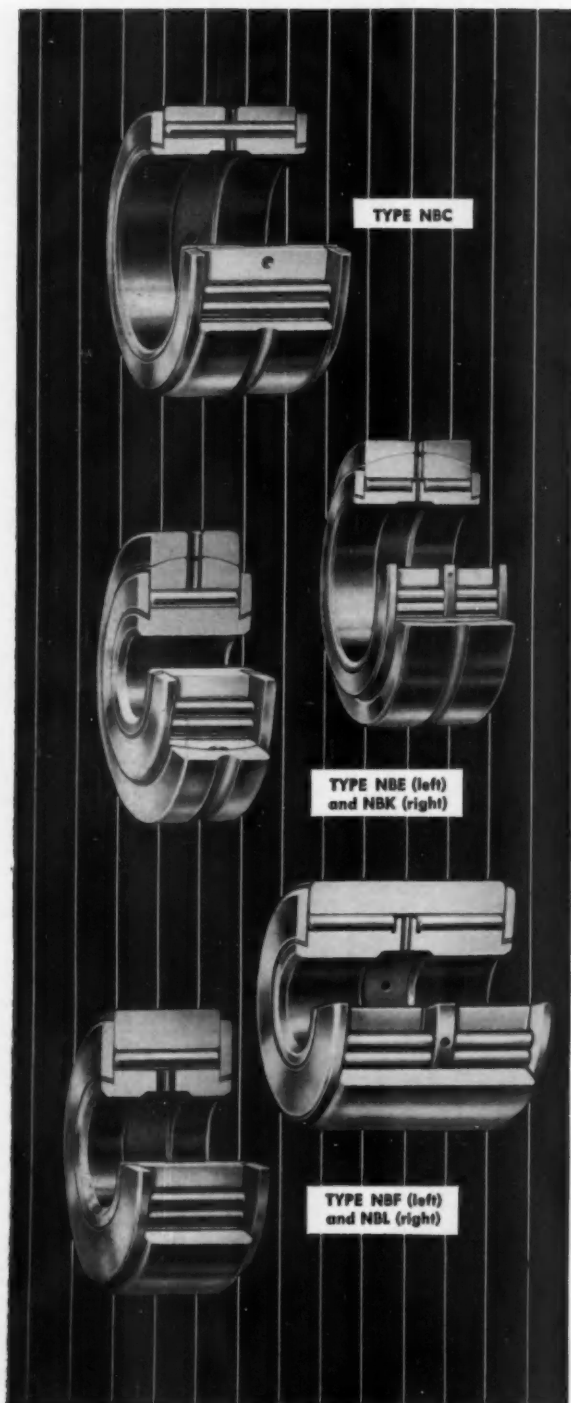
Mechanical Goods Division

**United States Rubber**

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### For Oscillating Motion or Heavy Rolling Loads



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AUTOMOTIVE INDUSTRIES, May 15, 1956



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**YOU CAN PROFIT** many ways by submitting your magneto ignition problems to Fairbanks-Morse engineers.

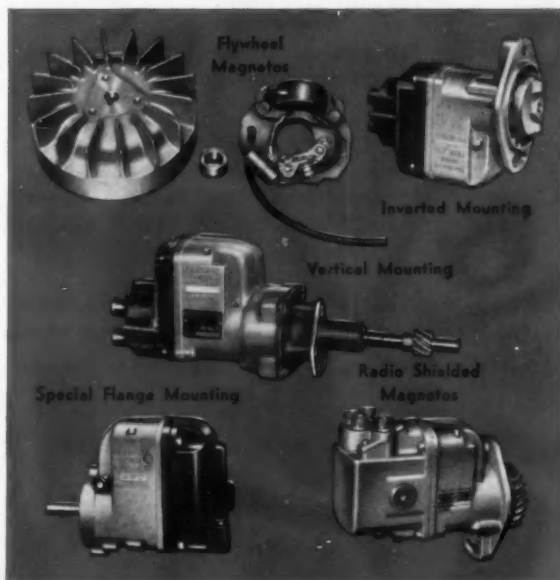
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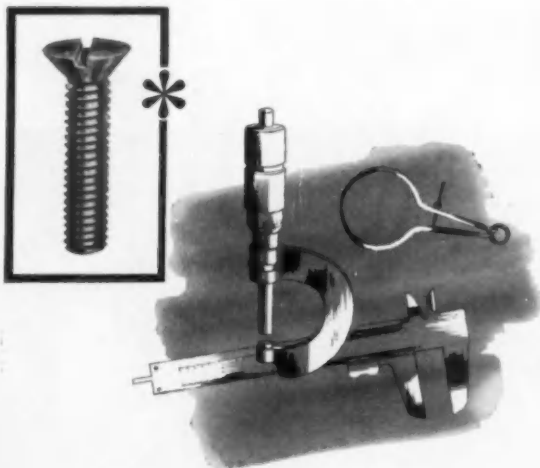


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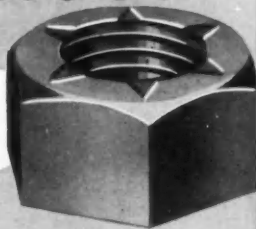
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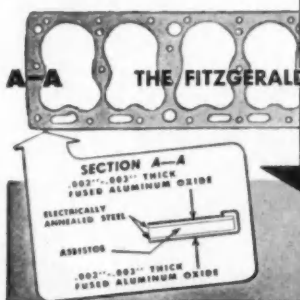
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Over 85% of the torque wrenches used in industry are

## *Sturtevant* **TORQUE WRENCHES**

Read by Sight, Sound or Feel

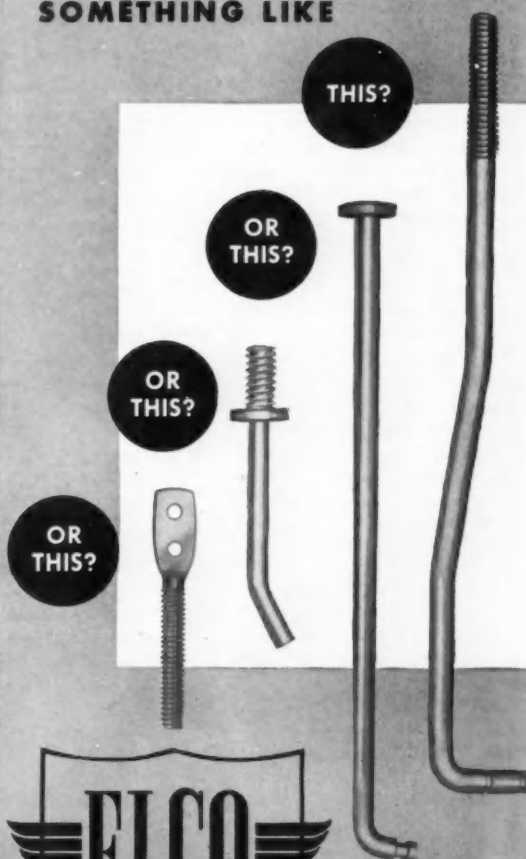
- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch grams  
...inch ounces  
...inch pounds  
...foot pounds

Every manufacturer,  
design and production  
man should have this valu-  
able data. Sent upon request.

P.A. **Sturtevant Co.**  
ADDISON [QUALITY] ILLINOIS

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Cold-heading, of course,  
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knobs, and upsets. The  
ends are roll-threaded.  
Kinks, bends, flats, and  
other forming is done on  
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portant consideration is  
that ELCO has all these  
facilities, and many more  
— acquired and developed  
through years of varied ex-  
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store of versatile ingenuity  
that can mean lower costs  
for you. Always consult your  
ELCO representative.

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MACHINE SCREWS  
MACHINE SCREW NUTS  
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DRIVE SCREWS  
SPECIAL SCREWS  
COLD HEADED PRODUCTS

**ELCO TOOL AND SCREW CORPORATION**  
1914 BROADWAY, ROCKFORD, ILLINOIS

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### Engineering Positions Available

**Project Engineers—Senior and Junior  
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## The All-Temperature Piston

UNIFORM SKIRT CLEARANCE FROM 20° BELOW ZERO TO 200° F

### STEEL TENSION MEMBER

Anchored only at pin bosses  
and cast in positive contact  
with I.D. of piston skirt

Controls Clearance Automatically

### Sensational Performance

Requires less than .001 Clearance

Cold or Hot, Clear-O-Matic Piston clearance stays constantly uniform. Required clearance is reduced to less than .001. This great development of the "All-Temperature" Piston by Zollner engineers provides another fine feature attraction for the modern motor car . . . smooth, quiet running engine . . . no cold slap . . . reduced friction without loss of durability or heat conductivity . . . no danger of scuffing or seizing. We suggest a test of these sensational performance advantages for your engine.

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PISTONS FOR GASOLINE EN-  
GINES FOR EVERY PURPOSE



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CLEARANCE  
AT ALL  
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THE ORIGINAL EQUIPMENT PISTONS

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New time-saving AMF Everlock pre-assembled screws and lockwashers. In types, sizes and materials to meet your needs.

**fasten it and forget it...**

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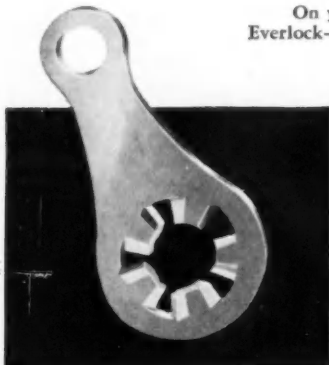


Tight, vibration-proof fastenings—for the life of your product.

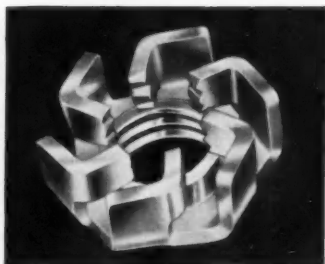
New AMF Everlock pre-assembled screws and lockwashers give you both . . . fast, one-operation application and vibration-proof tightness. Everlock washers, with the exclusive alternating chisel edges, actually bite into the surface of both screw and part. Even under the most punishing vibration, Everlock fasteners stay secure—for good!

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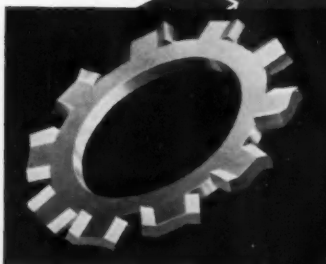
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Plain and lock types.



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Both National fine and National coarse threads.



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512 North Dearborn Street • Chicago 10, Illinois

SUBSIDIARY OF AMERICAN MACHINE & FOUNDRY CO., NEW YORK

"EVERLOCK" IS A REGISTERED TRADEMARK  
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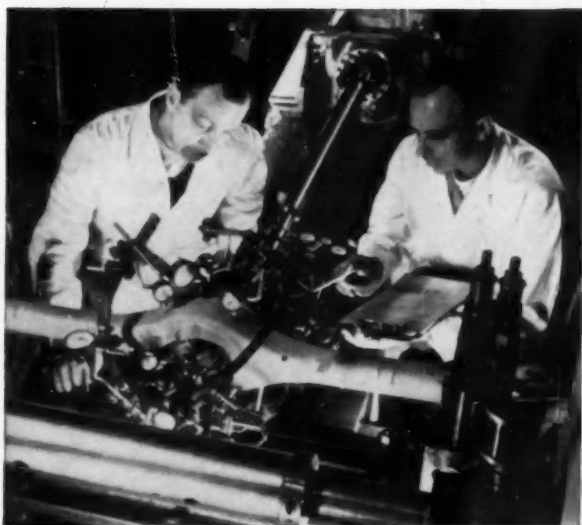
## There's safety in numbers like this



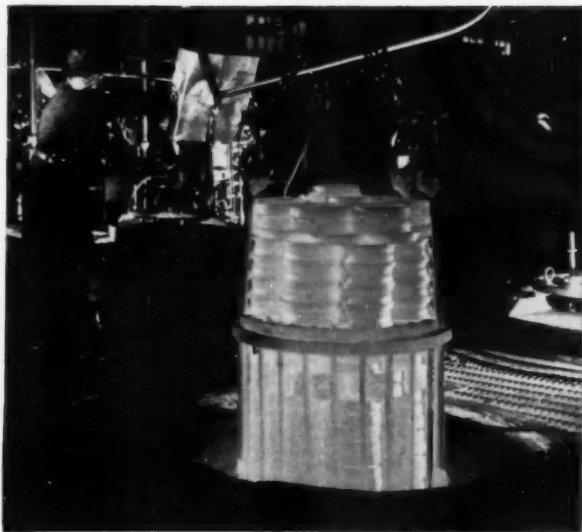
WHEN YOU SEE the number HM89410 on the cup—and HM89446 on the cone—it's safe to assume that the tapered roller bearing is a size often used on pinions. But you're a whole lot safer with the "Timken" trade-mark beside the number. That means you're getting *extra* quality and services.



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